The Local Impact of Woody Biomass Energy Projects: Quick Assessment Tool for Planners and Community Leaders User Manual

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INTRODUCTION

The *Local Impact of Woody Biomass Energy Projects: Quick Assessment Tools for Planners and Community Leaders* (the Assessment Tool) are user friendly software tools to help planners, development officials, municipal leaders and other community leaders evaluate proposed woody biomass-based energy projects and engage other community members concerning the measured impacts that increased use of woody biomass would have in

- the condition of local forests (forest health),
- air quality,
- highway traffic, and,
- local economic activities, such as tax revenues, and employment.

The Quick Assessment Tools are designed to prepare local officials to engage with project developers and interested members of the public in grounded discussions on the measured impacts of woody biomass projects on their communities, rather than the perceived impacts often reported. The Quick Assessment Tools also are intended to help local leaders achieve a degree of independent perspective without demanding months of discussion and outside analysis, by producing credible, reasonably accurate estimates of local impacts that do not require extensive prior knowledge of technical matters by local officials.

Using an Excel workbook format, the Quick Assessment Tools use user-defined inputs combined with data from the Forest Service Forest Inventory Analysis (FIA), Environmental Protection Agency (EPA), the project location's state transportation agency (when available), IMPLAN multipliers and the U.S. Census, to populate the Tool with default values for harvest activities, air quality, traffic, and economic conditions. The Quick Assessment Tools then forecast the impact of implementing a proposed biomass-based energy project on the baseline data. The Assessment Tools are intended to produce reasonably accurate results of changes in harvest activities, air quality, traffic and economic conditions.

The Assessment Tools should not be used in place of full feasibility studies. Through gathering of the data for the assessment it is beneficial for you to contact forestry, economic, transportation and air quality experts in your region to discuss the details of your specific project and determine if the Assessment Tool default values are appropriate to use in the assessment or if there is better data local available.

The Quick Assessment Tools are available in a Lite version and a Full version. The Lite version uses the Full version calculations with the data and default values described above in the background. In the Full version, assumptions, as well as default values can be readily modified to test impacts, display them in both tabular and graphic formats, and compare multiple complex models. If a user is curious about biomass heating systems, but does not have detailed

information on a particular proposal, it is possible to use estimated information for user inputs, rely upon defaults in the Full version of the assessment tool, or use the Lite version of the Assessment Tool, which can be found at http://biomassenergyqat.wordpress.com/lite-version-of-qat/.

Users should first run the Lite version of the Quick Assessment Tool.
If after using the Lite version, there are specific questions or scenarios that cannot be sufficiently addressed within the Lite version, users should then move to the Full version of the Quick Assessment Tool. It is good to take a look at the Lite version to get an idea of how the Tool works and the kind of results it produces before proceeding to the more complex Full version. For most biomass energy projects the Lite version of the Quick Assessment Tool is sufficient; the Full version should be used for larger projects and when the user is interested in modeling the project in great detail to assess the air emissions, forest impacts, traffic impacts and local economic impacts.

Both versions of the Quick Assessment Tool can be used with Windows 2003 or newer systems and saved on the users' computers in Excel file format (without Macros enabled) for future use. It is also possible to save multiple completed assessments to easily compare different scenarios (Go to page 28 of the User Manual to learn about how to compare multiple assessments using the NYBEA Biomass Project Compiler).

This User Manual is intended specifically for the Full Version of the Quick Assessment Tool and will discuss in detail how to enter the necessary information and how a user can adjust the parameters of an assessment to fit his or her project evaluation needs. *From this point in the manual on, unless otherwise noted, "Quick Assessment Tool" means the Full version of the Quick Assessment Tool.*

Happy Assessing!

KEY FEATURES

- The Quick Assessment Tool can be used by novice users using minimum inputs and default values;
- The Quick Assessment Tool can be modified by experts to override default values to better assess local impacts;
- The Quick Assessment Tool can assess multiple options at a single site including adding multiple fuels;
- The Quick Assessment Tool can be used anywhere by adding readily available data; and,
- The Quick Assessment Tool has easy to follow navigation and administration features to permit multiple users to work on a single assessment.

PRIOR KNOWLEDGE

With or without the help of experts, you can conduct very detailed complex evaluations of the impacts of biomass projects on the base line conditions in your community using the Full version of the assessment tool.

This tool is designed for you, community leaders, economic development officials and planning officials. You are not expected to have prior knowledge of biomass-based heating systems. You can provide as much detailed information as you have available or research with the help of experts or solely depend on the default values by using the Lite version of the assessment tool. *Expert detail is not required to run the assessment.*

BASIC INPUT CHECKLIST

This list describes the information that a novice user can gather prior to beginning the assessment and enter in the 9 basic input pages. If all of this information is not available the assessment can be run by accepting the default values built into the model. Next to the Quick Assessment Tool Input pages, there are instructions and hints on the necessary and optional inputs.

Basic Information about Existing and Proposed Heating Systems

In the nine basic input pages you will be prompted to provide some basic information about the existing systems and the proposed systems. This information can be provided by the system operator, the manufacturer of the system, or directly from the system's nameplate. Default values when available are automatically used by the model when the user has not provided customized information.

Examples of information you will be prompted for include:

- the age of the existing system,
- type of heating fuel used for the existing system and the proposed system,
- annual fuel consumption,
- total square feet heated,
- basic economic information in regards to system decommission and proposed system installation,
- name plate capacity, etc.

Fuels

You will be prompted to provide some basic information about the fuels used in the existing and proposed systems. Accept the default values by simply leaving input cells blank (**default values are displayed in green font adjacent to or below corresponding input cells**). The more specific information you provide for your project the more accurate the model will be. It is also possible to create custom boiler, truck and equipment fuels (see page 17 of this User Manual, for more information).

Information you will be prompted for includes:

- fuel price;
- average moisture content;
- percentage of fuel that is renewable;

- cogeneration information.

Economic Information
While completing the basic input pages in the assessment tool you will be prompted for some basic economic information; if you do not have the information for which you are prompted, you can accept the default values by simply leaving input cells blank. As explained earlier, the more information you can provide specific to your project, the more accurate the results will be. Information you will be prompted for includes but is not limited to payroll and expenses information, fuel and transportation costs, definitions of regional and local economies, operating costs, and capital investments, etc.

Biofuels and Fuel Distribution
The final portion of the basic input section will prompt the user for information regarding the distribution of fuel that is used in the existing system and about fuel that will be used in the proposed system. The user will also be prompted for information about any biofuels that will be used. Default values are automatically used by the model wherever user information is not provided. Information you will be prompted for includes but is not limited to type of fuel used, sustainable harvest criteria, moisture content of wood chips, counties in which forest harvest takes place, etc.

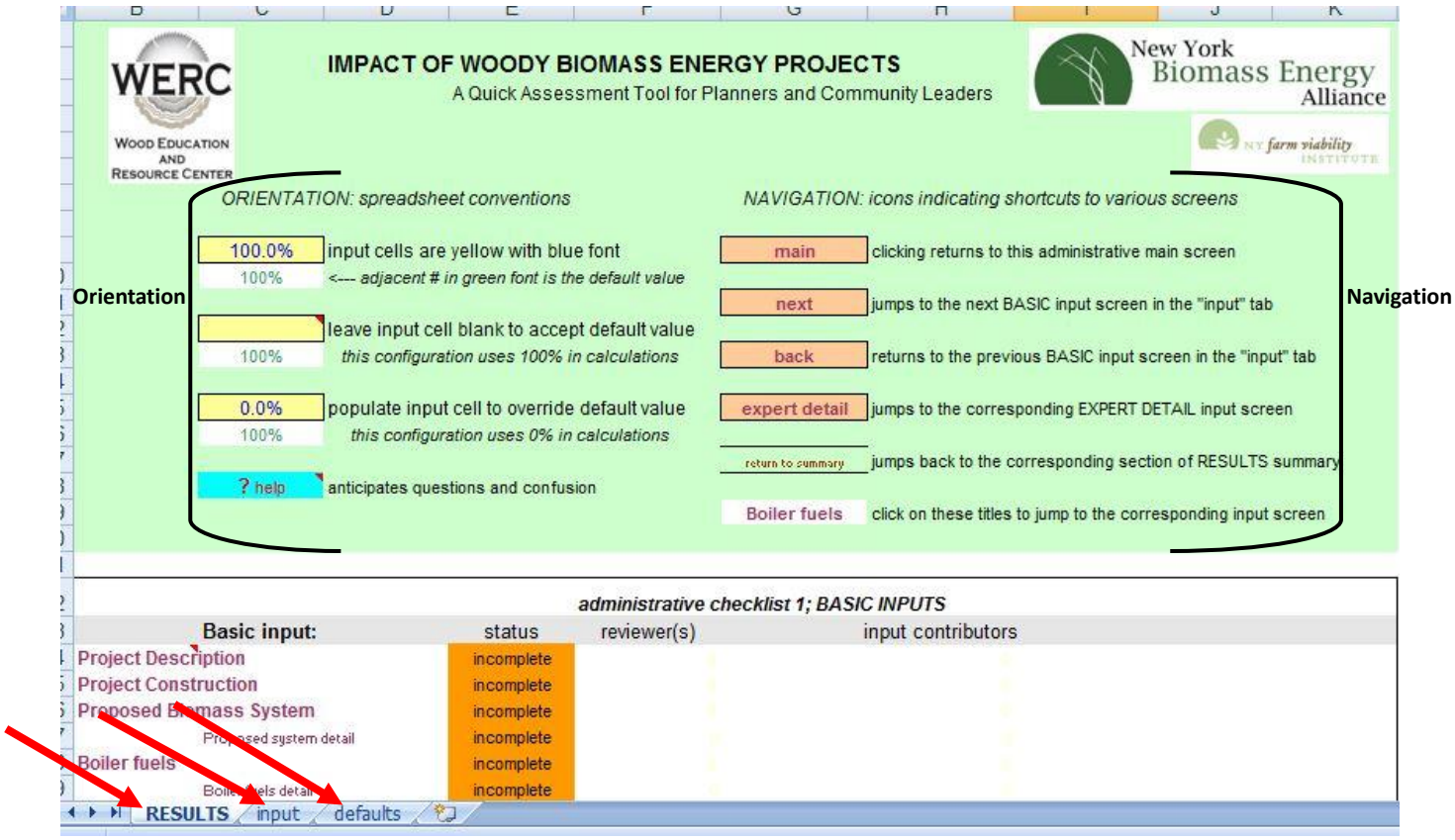
USING THE TOOL

After you gather information outlined in the **Basic Input Check List**, the Quick Assessment Tool (QAT) can be downloaded from http://biomassenergyqat.wordpress.com/full-version-of-qat/. When the download is complete, save the Excel file on your computer; you can work with and save any progress in the Quick Assessment Tool once it has been saved on your computer.

To save your assessment simply use the "save as" function in Excel and save the Quick Assessment Tool in an appropriate folder on the hard drive of your computer. Choose a file name specific to the project – in the event you assess multiple versions of the same project, it is important to differentiate the assessments by file name. The file type should be the most recent version of Excel that your computer possesses. **DO NOT ENABLE MACROS when saving the Quick Assessment Tool.** The file does not need macros enabled to run. As you input information into the Quick Assessment Tool, periodically save the file, so if the program is interrupted for whatever reason, your most recent inputs are not lost. It is recommended that you download a new copy of the tool from the web site for each assessment you conduct.

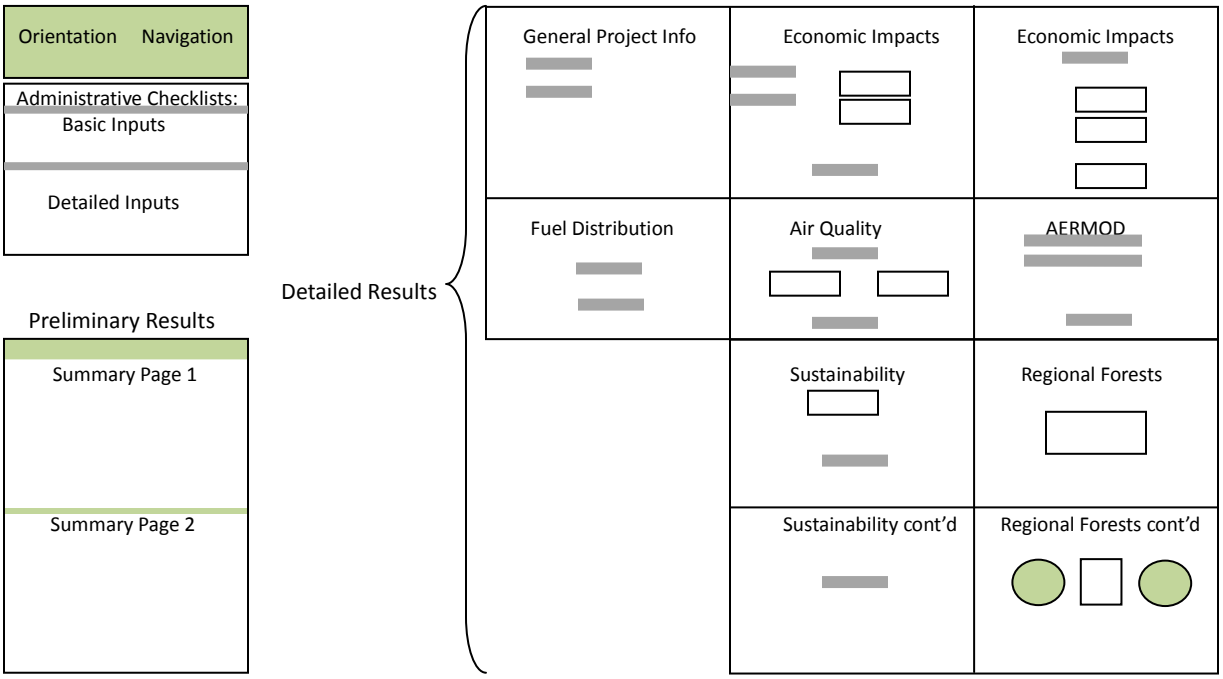
RESULTS Tab

When you open a new copy of the Quick Assessment Tool, there will be three tabs you can view within the Quick Assessment Tool, shown by the red arrows, below. The RESULTS page is the first Tab. When you open, the Quick Assessment Tool, you will see the first worksheet or "tab", labeled "RESULTS." This is where the results of the assessment will be displayed after all the inputs are entered. A Schematic of the RESULTS Tab can be found on page 10.



Schematic of RESULTS Tab

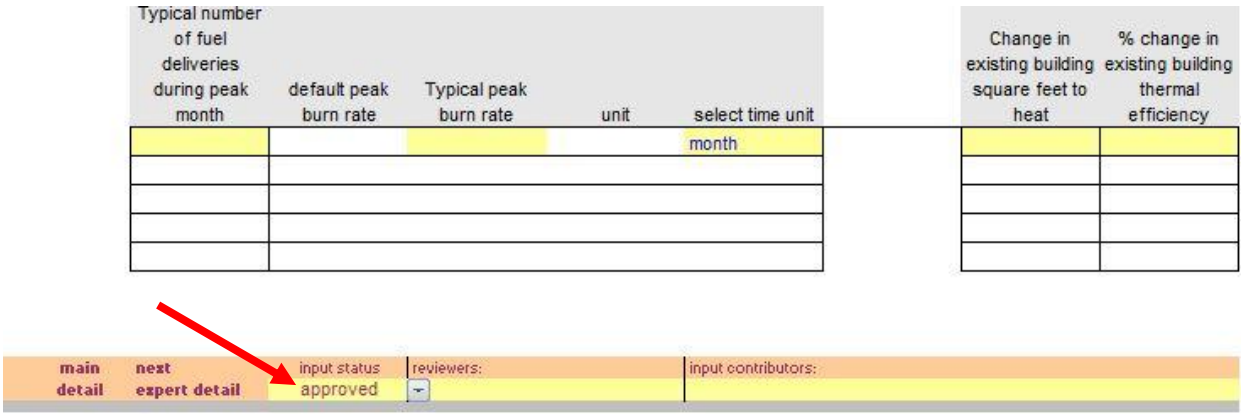
If you were to "zoom out" on the RESULTS Tab, you would be able to see all of the information that is displayed on this tab. The Schematic, below, identifies what each part of the RESULTS Tab is and where it is located in relation to the other components.



At the top of **page one** of the RESULTS Tab is a green field; in the top left of this field, there is an **orientation** that explains how to identify and use input cells and default values, as well as information about **navigation** (top right) and help buttons. A detailed explanation of the information in the orientation box follows:

- Input cells are yellow with blue font;
- Input cells may be left blank to accept the **default value**, which is located in an adjacent cell with green font;
- Pop-up Help boxes are either blue with red font or simply have a little red triangle in the upper right corner -- hover over the cell and a helpful tip or explanation will pop-up;
- Click on white cells with purple font to jump to the corresponding input screen;
- Click "Main" to return to the orientation/navigation page on the RESULTS Tab;
- Clicking "Next" takes you to the next basic input screen under the INPUT tab
- Clicking "Back" takes you to the previous input screen in the INPUT tab
- Using the "Expert Detail" tab you can jump to the corresponding expert or detailed input screen

Below the orientation is a record of the user's progress through the 9 basic input pages. On each of the input pages, located on the INPUT Tab (for more on the INPUT Tab, go to page 11 of this User Manual), there is an "input status" drop-down cell shown, by the red arrow:



When the input page is complete to the user's satisfaction, the "approved" cell should be selected. The basic inputs status summary, *Administrative Checklist 1*, on the RESULTS Tab will then show the input page as "approved." Each input page also has input cells for you to enter names of individual data contributors and reviewers. The administrative checklists and review function are set up in order to help facilitate assessments that are being done with multiple users providing input. This allows for multiple users to be accountable for gathering information to be used in the assessment.

After the basic input status summary, is a status summary of the detailed input pages. If the detailed input pages are not used, the "status" will read "defaults OK," as indicated below by the red arrow. When detailed input *is* provided on a detailed input page the status will reflect the additional input when the user updates the detailed input status on the input page, as indicated, by the orange arrow.

The remainder of the RESULTS Tab will display the results of your assessment when you have completed entering data as shown in the Schematic of the RESULTS Tab, on page 10 of this User Manual.

INPUT Tab

The INPUT Tab is where the user will enter the information described in the section titled "Check List". The INPUT Tab consists of 27 input pages. See the schematic of the INPUT Tab on page 14 of this user manual.

General Instructions for the FULL version Biomass Assessment Tool

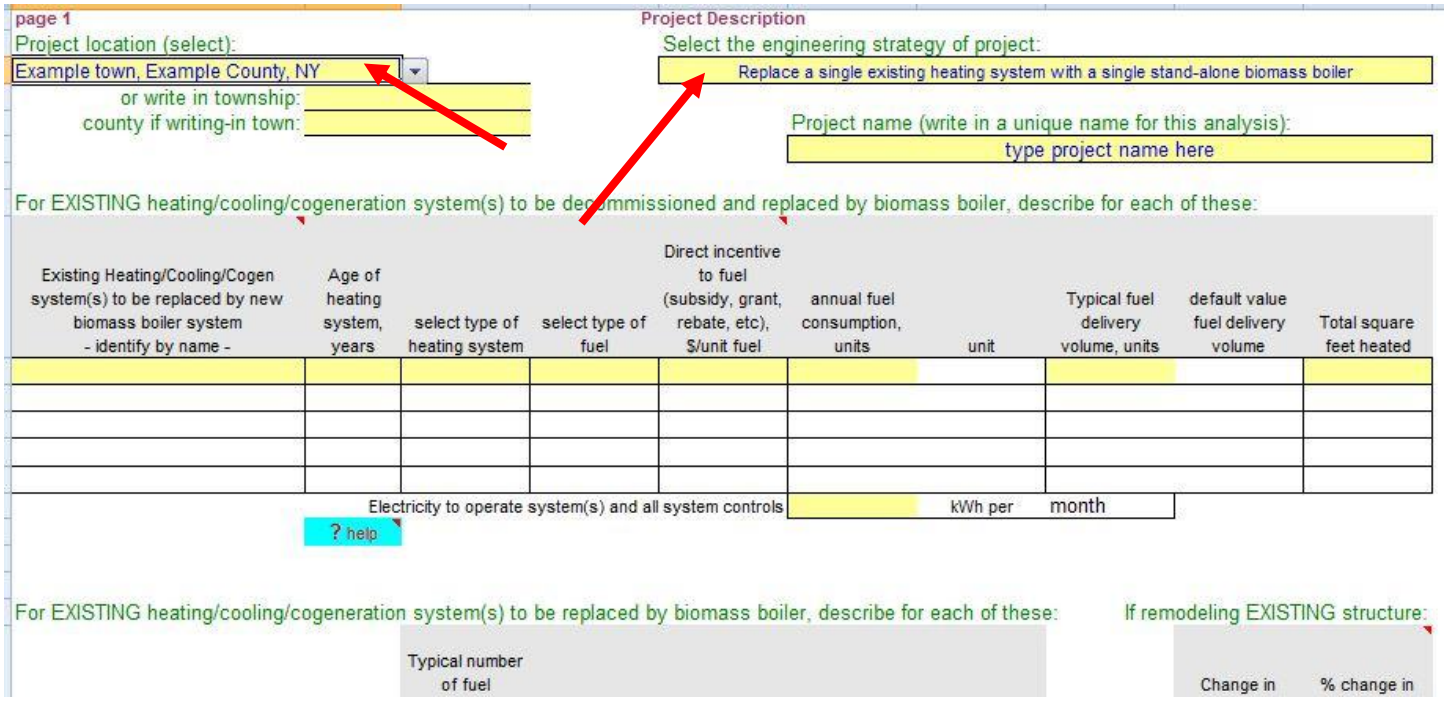
This analysis integrates specialty areas of economics, traffic, air quailty and forestry in a systems context for any of a wide range of possible biomass projects. Of necessity, the science of each specialty area is grossly oversimplified in this model but pains have been taken to incorporate reasonable assumptions and acceptable approximate default values wherever possible to closely support the non-specialist user. These default values are adapted from many credible sources and are not intended to chronicle or document regulatory standards or industry best practices. In most instances default values are clearly displayed and can easily be edited. The user is encouraged to consult experts as needed and is advised to review pertinent academic literature in order to confirm data inputs and validate any results this analysis might generate.

The general instructions, to the left, can be found in cells **M1:M13**, of the INPUT Tab.

Of the 27 pages in the INPUT Tab, the first 9 pages are the basic input pages and need to be completed; the remaining 17 pages (page 24 is intentionally left blank) are to enter moderate to expert level detail -- as much detailed information as you possess can be entered on the moderate and expert detail pages.

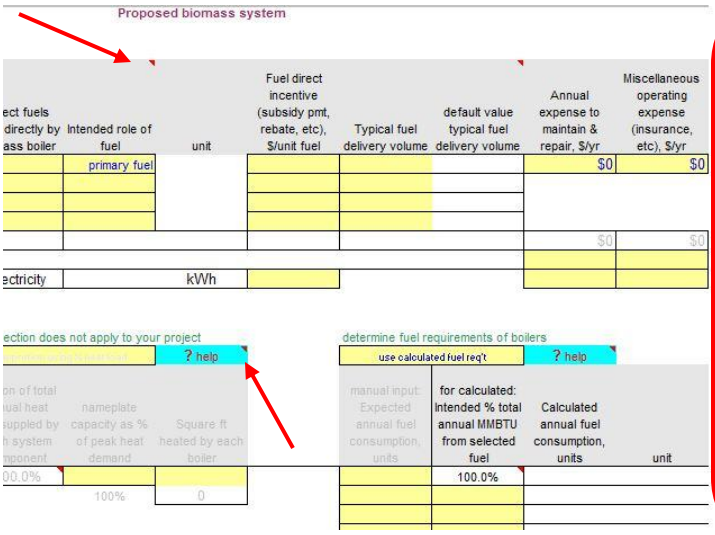
As explained in Navigation, by clicking the detail or the expert detail buttons on the bottom of each page the user can navigate to the corresponding moderate and expert detail input pages to provide additional information for more precise results.

Input should begin on **page 1**, by identifying the project location and selecting the engineering strategy of the project, as shown by the red arrows below. Both cells indicated by the arrows are drop down menus.


page 1
Project Description
Project location (select):
Example town, Example County, NY
or write in township:
county if writing-in town:
Select the engineering strategy of project:
Replace a single existing heating system with a single stand-alone biomass boiler
Project name (write in a unique name for this analysis):
type project name here
For EXISTING heating/cooling/cogeneration system(s) to be decommissioned and replaced by biomass boiler, describe for each of these:
Existing Heating/Cooling/Cogen system(s) to be replaced by new biomass boiler system - identify by name -
Age of heating system, years
select type of heating system
select type of fuel
Direct incentive to fuel (subsidy, grant, rebate, etc), $/unit fuel
annual fuel consumption, units
unit
Typical fuel delivery volume, units
default value fuel delivery volume
Total square feet heated
Electricity to operate system(s) and all system controls
kWh per
month
? help
For EXISTING heating/cooling/cogeneration system(s) to be replaced by biomass boiler, describe for each of these:
If remodeling EXISTING structure:
Typical number of fuel
Change in
% change in

Hint: To blank an input cell that contains data, simply highlight the cell and press <delete> or <backspace> and <enter>. Entering <0> (zero) will not invoke the default value, but will cause the model to calculate using a value of zero.

Detailed instructions for each of the input pages can be found adjacent to or near the corresponding input page and within pop-up help boxes, indicated by a little red triangle in the top right corner of a cell. For examples, see the instruction boxes for **page 3**, and **pages 4 & 13**, below.


Proposed biomass system
ect fuels directly by ass boiler
Intended role of fuel
unit
Fuel direct incentive (subsidy pmt, rebate, etc), $/unit fuel
Typical fuel delivery volume
default value typical fuel delivery volume
Annual expense to maintain & repair, $/yr
Miscellaneous operating expense (insurance, etc), $/yr
primary fuel
$0
$0
ectricity
kWh
ection does not apply to your project
? help
determine fuel requirements of boilers
use calculated fuel req't
? help
nameplate capacity as % of peak heat demand
Square ft heated by each boiler
manual input: Expected annual fuel consumption, units
for calculated: Intended % total annual MMBTU from selected fuel
Calculated annual fuel consumption, units
unit
100.0%
100%
0

Instructions for Page 3

This is where biofuels are selected and managed in the proposed system. The model accomodates a wide variety of system configurations and fuel combinations. You will be describing only one - your own. Proceed line by line through page 3 to describe your proposed biomass boiler system.

<--- Begin by describing the new biomass boiler, select fuels you expect to use in the boiler, how each fuel will be used and in what volume it will be delivered. Use "backup fuel" for a built-in backup system. Also enter costs to operate, maintain and routinely repair the new biomass boiler.

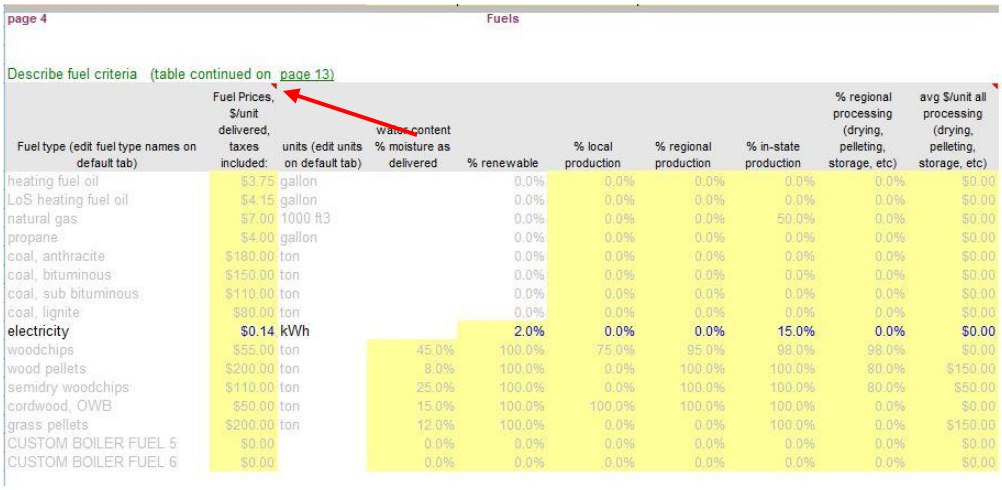
<--- Describe any stand-alone auxiliary boiler to be included in the proposed system. If you are keeping your existing boiler and supplementing it with a proposed new biomass boiler, describe the new biomass boiler above and describe the existing boiler as an "auxiliary system" on this line. Fuels must be apportioned between the new biomass boiler and auxiliary boiler -- accomplish that in the input block at the left of the page, **cells E79:G83**.

<--- This input block, **cells I79:J83**, is where you manage how fuels will be used in the proposed system. In **column J79:J83** you inform the model which fuels to use in the biomass boiler and in what proportions. You may mix and match fuels in any combination.

From your earlier description of the existing system on pages 1, 2, 10, 11, 19 & 20 the model calculates fuel requirements for the new proposed system. These are shown as default values (in green font) in **column K79:K83** alongside your fuel selections. If these are satisfactory select "use calculated fuel req't" from the dropdown in **cell I77**.

Calculated values can be manually overridden if desired. From the dropdown in **cell I77** select "manual input overrides calculated" and on the corresponding fuel line in **column I79:I82** enter an alternative fuel volume in the designated units. The model will now use the manually entered value for that fuel in the place of the calculated value. NOTE: manually entering a fuel volume changes the total fuel consumption of the system - calculated values are not reformulated.

The model can be run using only manually input fuel consumption by selecting "use manual fuel req't" from the dropdown in **cell I77**. This setting


page 4
Fuels
Describe fuel criteria (table continued on page 13)
Fuel type (edit fuel type names on default tab)
Fuel Prices, $/unit delivered, taxes included:
units (edit units on default tab)
water content % moisture as delivered
% renewable
% local production
% regional production
% in-state production
% regional processing (drying, pelleting, storage, etc)
avg $/unit all processing (drying, pelleting, storage, etc)
heating fuel oil $3.75 gallon 0.0% 0.0% 0.0% 0.0% 0.0% $0.00
LoS heating fuel oil $4.15 gallon 0.0% 0.0% 0.0% 0.0% 0.0% $0.00
natural gas $7.00 1000 ft3 0.0% 0.0% 0.0% 50.0% 0.0% $0.00
propane $4.00 gallon 0.0% 0.0% 0.0% 0.0% 0.0% $0.00
coal, anthracite $180.00 ton 0.0% 0.0% 0.0% 0.0% 0.0% $0.00
coal, bituminous $150.00 ton 0.0% 0.0% 0.0% 0.0% 0.0% $0.00
coal, sub bituminous $110.00 ton 0.0% 0.0% 0.0% 0.0% 0.0% $0.00
coal, lignite $80.00 ton 0.0% 0.0% 0.0% 0.0% 0.0% $0.00
electricity $0.14 kWh 2.0% 0.0% 0.0% 15.0% 0.0% $0.00
woodchips $55.00 ton 45.0% 100.0% 75.0% 95.0% 98.0% 98.0% $0.00
wood pellets $200.00 ton 8.0% 100.0% 0.0% 100.0% 100.0% 80.0% $150.00
semidry woodchips $110.00 ton 25.0% 100.0% 0.0% 100.0% 100.0% 80.0% $50.00
cordwood, OWB $50.00 ton 15.0% 100.0% 100.0% 100.0% 100.0% 0.0% $0.00
grass pellets $200.00 ton 12.0% 100.0% 0.0% 0.0% 100.0% 0.0% $150.00
CUSTOM BOILER FUEL 5 $0.00 0.0% 0.0% 0.0% 0.0% 0.0% 0.0% $0.00
CUSTOM BOILER FUEL 6 $0.00 0.0% 0.0% 0.0% 0.0% 0.0% 0.0% $0.00

Instructions for pages 4 & 13

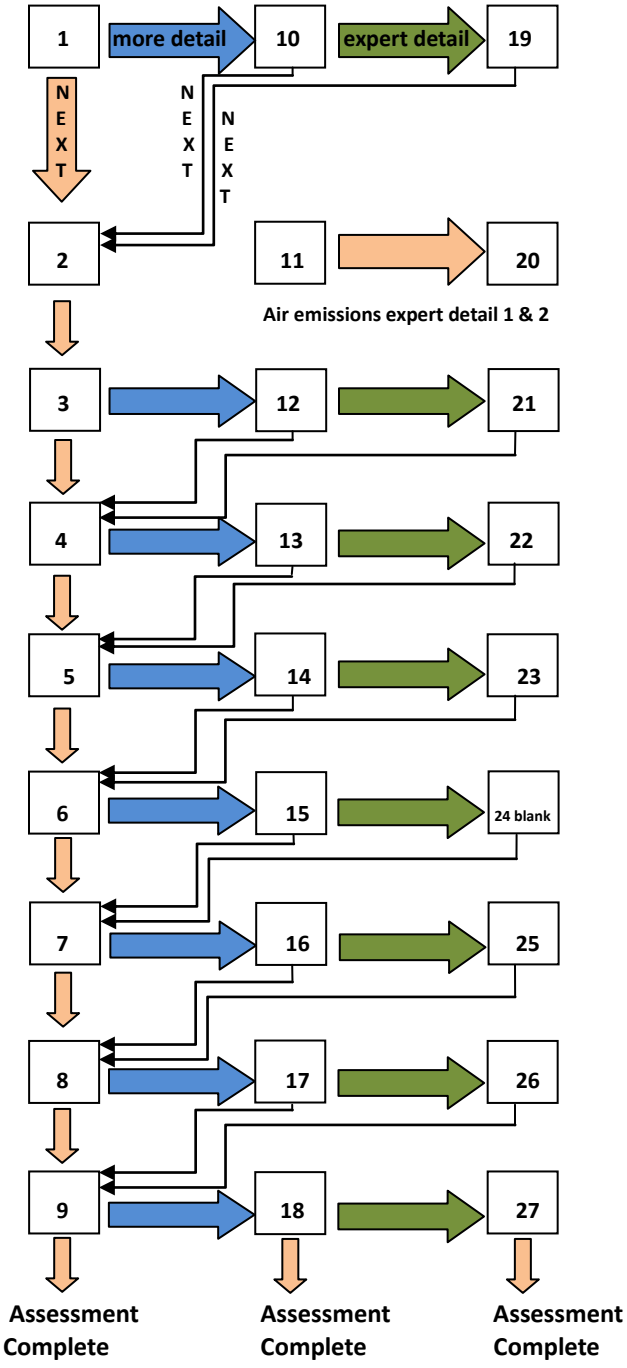
Here is where you describe characteristics of your selected fuels, including retail price, moisture content (where applicable), renewability, where fuels are produced relative to your local and regional economies, where fuels are processed (when applicable) relative to your local and regional economies, where the respective fuel distributor is located relative to your local and regional economies, nuances of taxation (when applicable) and an indication of foreign (ie: outside the USA) production.

To ease data entry only fuels you have selected for your analysis are shown in bold font. These fuels require you to review and edit all corresponding input values. Fuels that you have not selected are shown in faded font and do not require any attention or editing since they will not affect model calculations for your analysis.

Custom fuels can be created (see user manual for detailed instructions) to match specifications of any existing fuel or biomass fuel you may be contemplating.

Schematic of INPUT Tab

If you were to "zoom out" on the INPUT Tab, you would see all of the input pages that are displayed on this tab. The Schematic, below, shows how you can navigate through the input pages; ***keep in mind: you can use some moderate and expert detail input pages and ignore others, if that suits your project.***



Detailed Inputs

When you have specific project information for the moderate and expert detail pages, it is appropriate to use the project information rather than default values. The moderate and expert detail pages are designed for you to obtain site, or project specific information, often with the assistance of local experts in each field. Please keep in mind that you do not need to complete all of the moderate and expert detail pages to use the assessment tool – you can complete as much or as little moderate and expert detail as you are able and still run the assessment.

These detailed inputs are designed for professionals and should be used in instances where you need very site and project specific information to analyze your new system's impacts. More specific instructions can be found in the instruction boxes and in the pop-up windows on the INPUT Tab.

For more information and expert assistance, see the following recommendations:

Emissions
http://epa.gov/
State Environmental Agency

Project Details
Manufacturer of the proposed biomass system
Your project's facilities manager
Consulting engineer

Forestry Information
http://www.fs.fed.us/
State forester
State environmental agency
Local logging enterprise

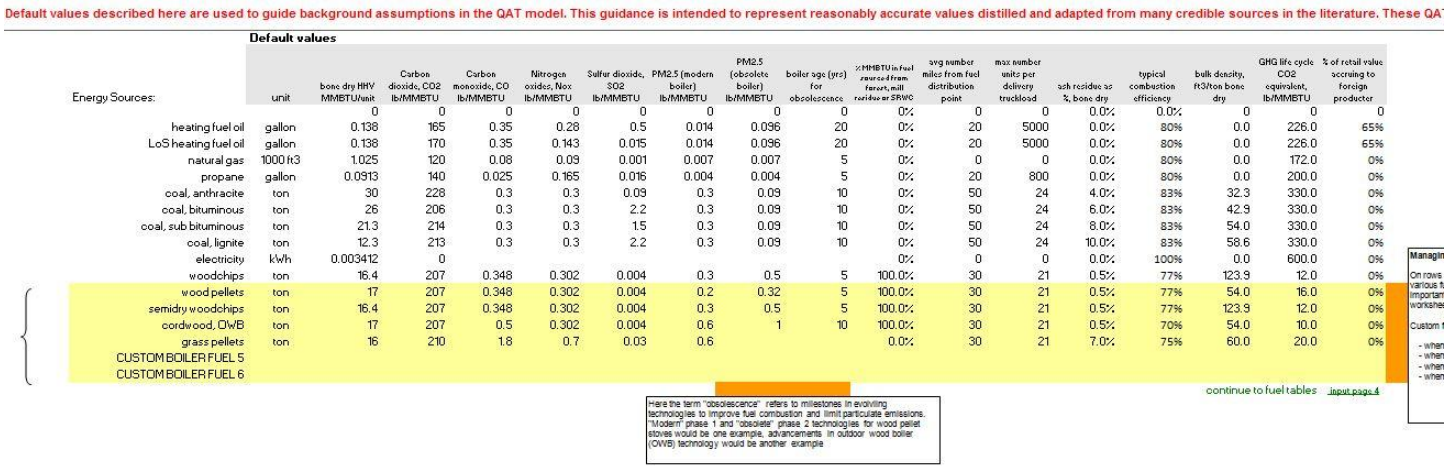
Transportation Information
http://www.dot.gov/contact-us
State transportation department

Demographic/Economic Information
http://www.census.gov/2010census/ and http://www.factfinder2.census.gov/
Regional, County or local economic development agency or planning department

DEFAULTS Tab

The DEFAULTS Tab is made up of tables containing information that is used by the model to complete the pages in the INPUT Tab wherever user information is not provided. The DEFAULTS Tab is where expert users can modify the defaults and create custom options such as custom boiler fuels; for more information on how to create custom fuels, go to page 17 of this User Manual. Other than to create custom fuels, the typical user will have no need to refer to the DEFAULTS Tab. The very expert user may, on rare occasions, desire to alter one or more default values on the DEFAULTS Tab. Altering values on the DEFAULTS Tab affects all relevant calculations throughout the spreadsheet, so modifications to the DEFAULTS Tab should be carefully considered beforehand.

Default values are automatically inputted when cells are left blank. Values can be examined in the DEFAULTS Tab, below. Reasonable default values, based on contemporary industry standards, are made available for energy sources, fuel units, payroll, sales and expenses, peak information, etc. ***For air permit thresholds, it is recommended that you contact your state environmental agency and discuss the specific regulations that would be applicable to your project.***



Default values described here are used to guide background assumptions in the QAT model. This guidance is intended to represent reasonably accurate values distilled and adapted from many credible sources in the literature. These QA

Default values

Energy Sources:	unit	bone dry HHV MMBTU/unit	Carbon dioxide, CO2 lb/MMBTU	Carbon monoxide, CO lb/MMBTU	Nitrogen oxides, Nox lb/MMBTU	Sulfur dioxide, SO2 lb/MMBTU	PM2.5 (modern boiler) lb/MMBTU	PM2.5 (obsolete boiler) lb/MMBTU	boiler age (yrs) for obsolescence	% MMBTU in fuel sourced from forest, mill residue or SRWC	avg number miles from fuel distribution point	max number units per delivery truckload	ash residue as %, bone dry	typical combustion efficiency	bulk density, ft3/ton bone dry	GHG life cycle CO2 equivalent, lb/MMBTU	% of retail value accruing to foreign producter
		0	0	0	0	0	0	0	0	0%	0	0	0.0%	0.0%	0	0	0
heating fuel oil	gallon	0.138	165	0.35	0.28	0.5	0.014	0.096	20	0%	20	5000	0.0%	80%	0.0	226.0	65%
LoS heating fuel oil	gallon	0.138	170	0.35	0.143	0.015	0.014	0.096	20	0%	20	5000	0.0%	80%	0.0	226.0	65%
natural gas	1000 ft3	1.025	120	0.08	0.09	0.001	0.007	0.007	5	0%	0	0	0.0%	80%	0.0	172.0	0%
propane	gallon	0.0913	140	0.025	0.165	0.016	0.004	0.004	5	0%	20	800	0.0%	80%	0.0	200.0	0%
coal, anthracite	ton	30	228	0.3	0.3	0.09	0.3	0.09	10	0%	50	24	4.0%	83%	32.3	330.0	0%
coal, bituminous	ton	26	206	0.3	0.3	2.2	0.3	0.09	10	0%	50	24	6.0%	83%	42.9	330.0	0%
coal, sub bituminous	ton	21.3	214	0.3	0.3	1.5	0.3	0.09	10	0%	50	24	8.0%	83%	54.0	330.0	0%
coal, lignite	ton	12.3	213	0.3	0.3	2.2	0.3	0.09	10	0%	50	24	10.0%	83%	58.6	330.0	0%
electricity	kWh	0.003412	0							0%	0	0	0.0%	100%	0.0	600.0	0%
woodchips	ton	16.4	207	0.348	0.302	0.004	0.3	0.5	5	100.0%	30	21	0.5%	77%	123.9	12.0	0%
wood pellets	ton	17	207	0.348	0.302	0.004	0.2	0.32	5	100.0%	30	21	0.5%	77%	54.0	16.0	0%
semidry woodchips	ton	16.4	207	0.348	0.302	0.004	0.3	0.5	5	100.0%	30	21	0.5%	77%	123.9	12.0	0%
cordwood, OWB	ton	17	207	0.5	0.302	0.004	0.6	1	10	100.0%	30	21	0.5%	70%	54.0	10.0	0%
grass pellets	ton	16	210	1.8	0.7	0.03	0.6			0.0%	30	21	7.0%	75%	60.0	20.0	0%
CUSTOM BOILER FUEL 5																	
CUSTOM BOILER FUEL 6																	

continue to fuel tables Input page 4

Here the term "obsolescence" refers to milestones in evolving technologies to improve fuel combustion and limit particulate emissions. "Modern" phase 1 and "obsolete" phase 2 technologies for wood pellet stoves would be one example, advancements in outdoor wood boiler (OWB) technology would be another example

When to Use Default Values

Default values should be used when you do not have access to certain information. Using all or a majority of default values will produce more generalized results. ***Using values specific to the project will produce more accurate results*****.** That being said, there are default values from the USDA Forest Service Forest Inventory and Analysis National Program (FIA) and air quality data from the Environmental Protection Agency (EPA) that should only be changed in consultation with a professional of that field, i.e. a local forester in the case of altering the default FIA data values.

SPECIFIC SCENARIO INSTRUCTIONS

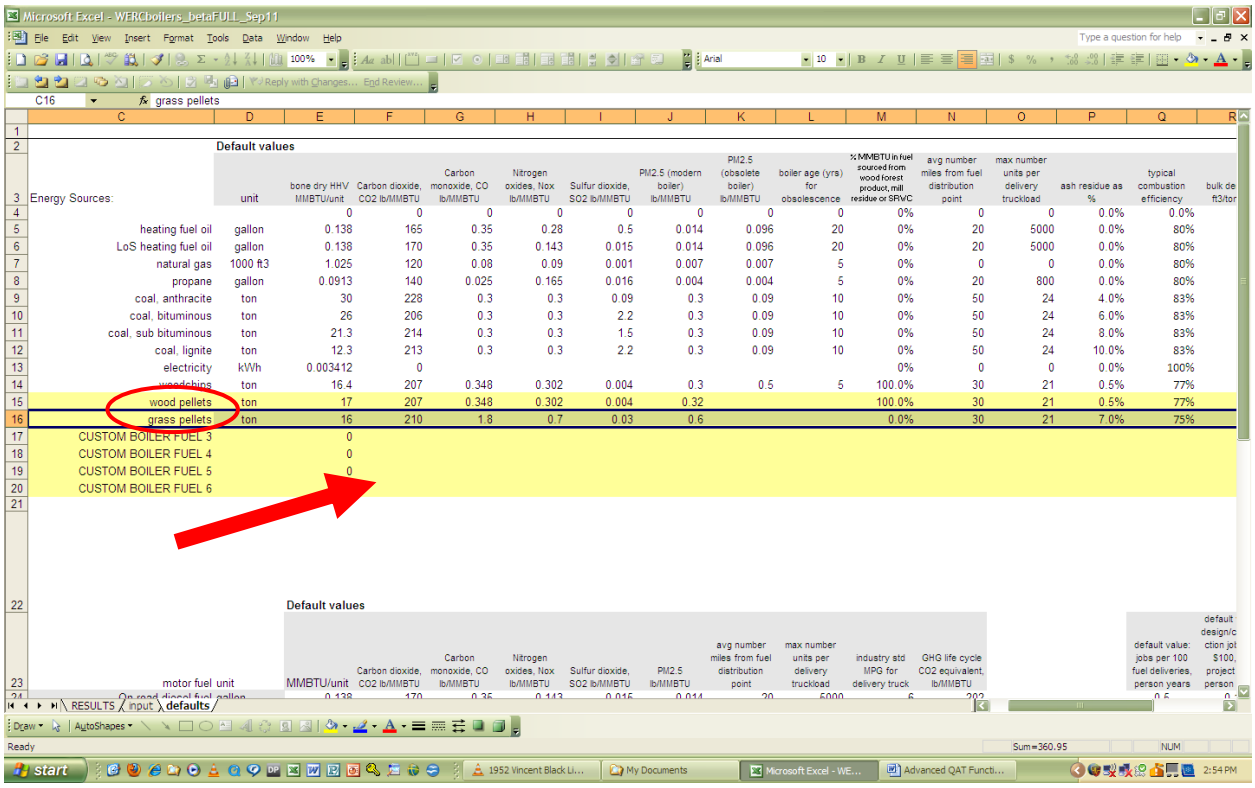
To help you navigate the tool and input all necessary information, below are described a few scenarios that will be common for users to model. Please check the web site for additional scenarios, hints and frequently asked questions -- http://biomassenergyqat.wordpress.com/.

How to Create Custom Fuels in the QAT

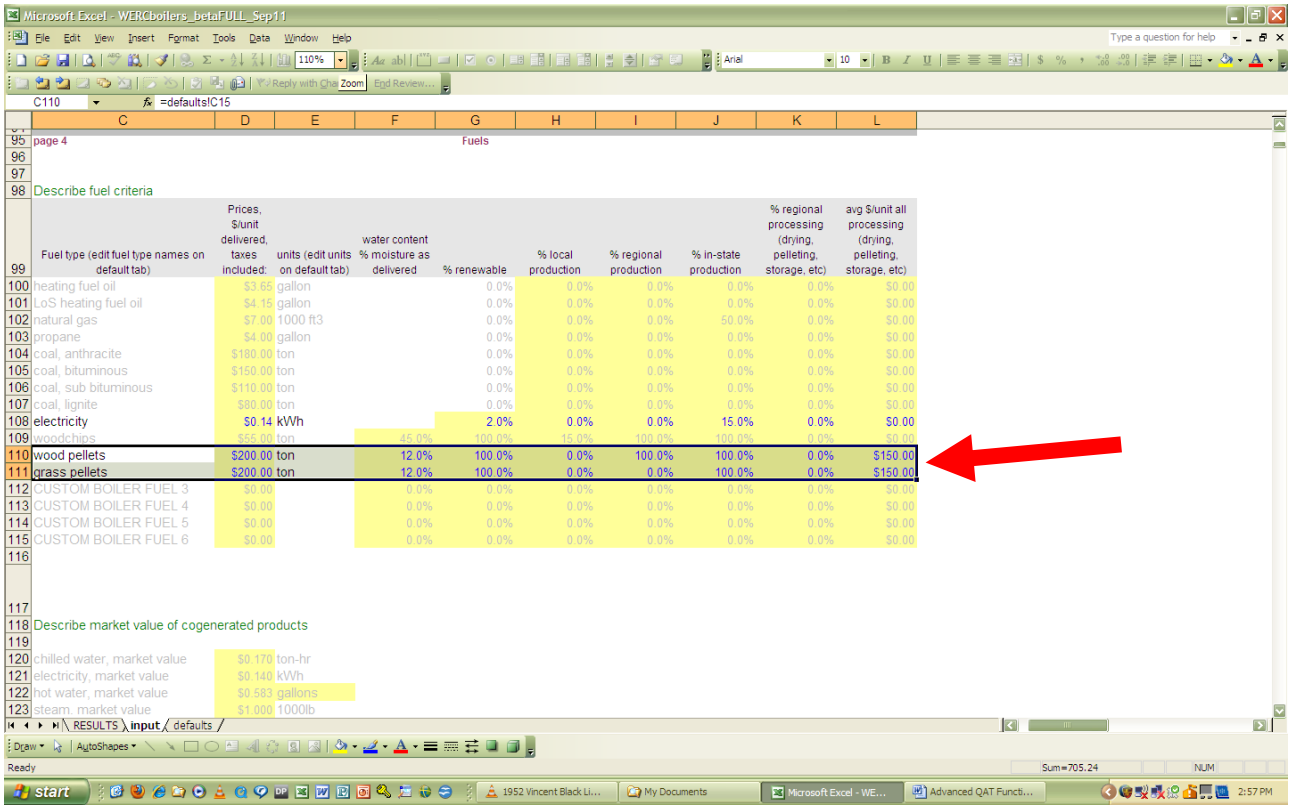
Custom Boiler Fuels:

Often you will need to work with fuels that are not included among the basic selection. The Quick Assessment Tool makes it easy to create custom boiler fuels in just 2 simple steps:

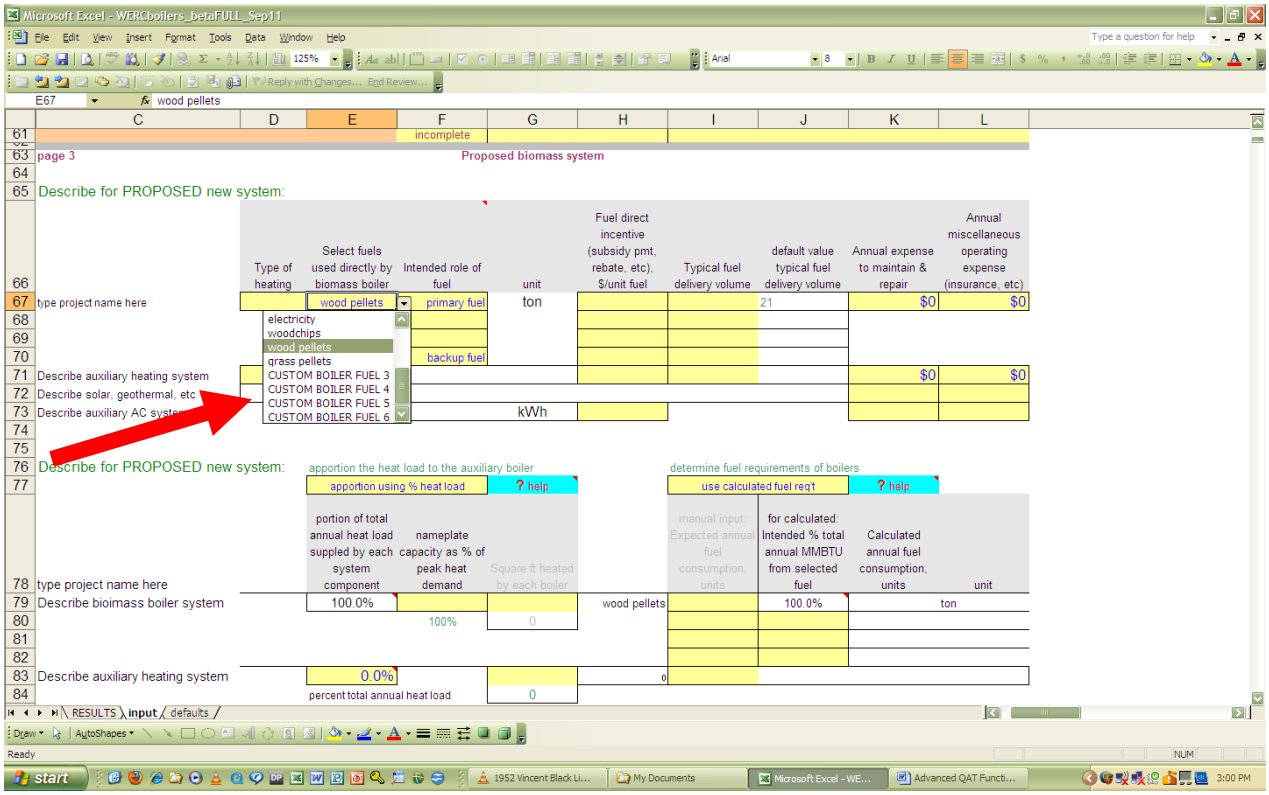
1. On the DEFAULTS Tab, new fuels can be entered on **rows 15-20**. In the example below we have entered custom fuels "wood pellets" and "grass pellets", including all fuel specifications:



2. The new fuels will now appear on the INPUT Tab, **pages 4 & 13**, where all remaining specifications MUST be entered, as illustrated below:


Microsoft Excel - WERCboilers_betaFULL_Sep11
page 4
Fuels
Describe fuel criteria
Fuel type (edit fuel type names on default tab)
Prices, $/unit delivered, taxes included:
units (edit units on default tab)
water content % moisture as delivered
% renewable
% local production
% regional production
% in-state production
% regional processing (drying, pelleting, storage, etc)
avg $/unit all processing (drying, pelleting, storage, etc)
heating fuel oil $3.65 gallon
LoS heating fuel oil $4.15 gallon
natural gas $7.00 1000 ft3
propane $4.00 gallon
coal, anthracite $180.00 ton
coal, bituminous $150.00 ton
coal, sub bituminous $110.00 ton
coal, lignite $80.00 ton
electricity $0.14 kWh
woodchips $55.00 ton
wood pellets $200.00 ton
grass pellets $200.00 ton
CUSTOM BOILER FUEL 3
CUSTOM BOILER FUEL 4
CUSTOM BOILER FUEL 5
CUSTOM BOILER FUEL 6
Describe market value of cogenerated products
chilled water, market value $0.170 ton-hr
electricity, market value $0.140 kWh
hot water, market value $0.583 gallons
steam, market value $1.000 1000lb
RESULTS
input
defaults

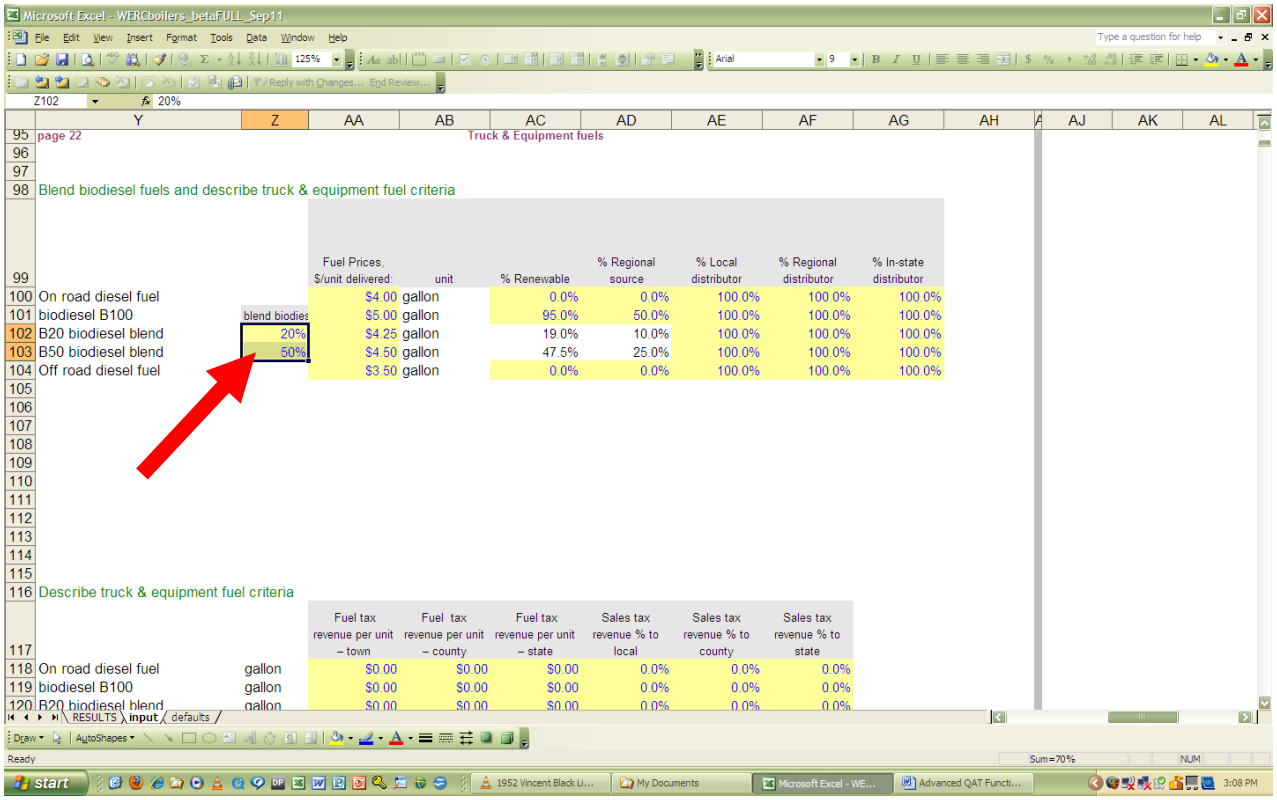
3. The new fuels will now appear among the selections in corresponding dropdown boxes throughout the model.



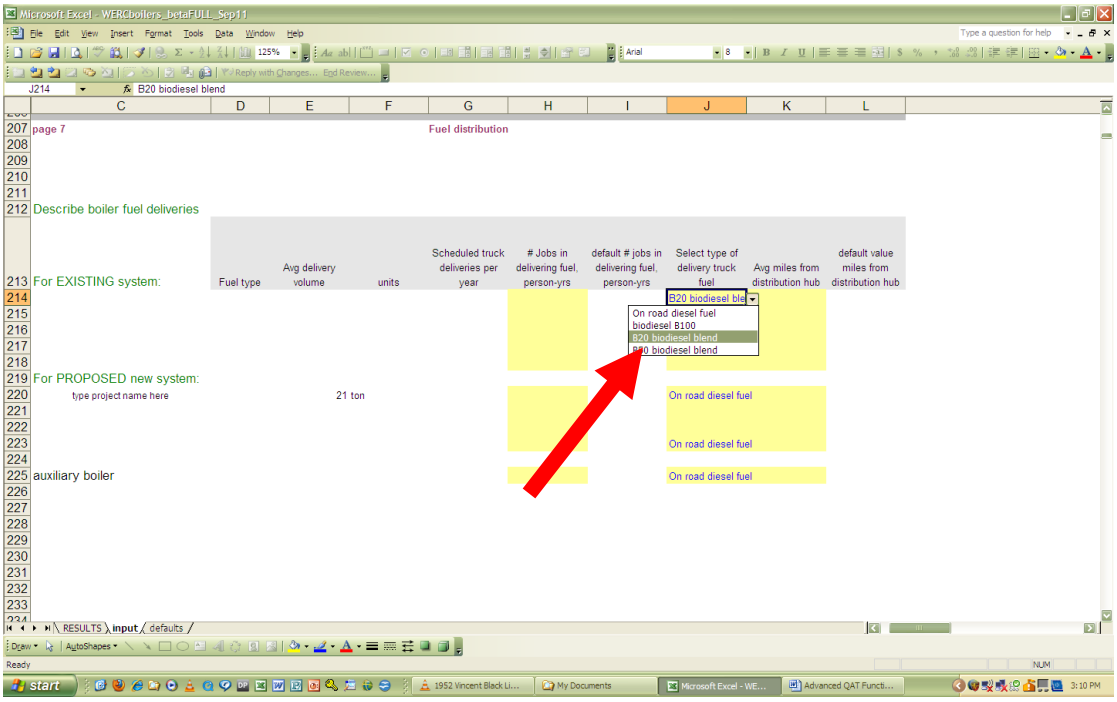
This feature makes it easy to work with similar fuels, perhaps with different suppliers and different prices, woodchips as an example, by simply creating unique custom woodchip fuels to represent chips sourced from each supplier. Later in setting up the analysis these fuels can easily be included or excluded to compare them as "alternate" fuels or they both can be included in their respective proportions in cases where both are necessary to supply annual fuel demand of a proposed boiler.

Custom Truck & Equipment Fuels:

Custom biodiesel blends are easily created on the INPUTS Tab, **page 22** "Truck & Equipment Fuels." Simply enter the desired percent biodiesel in the custom blends in cells **Z102** and **Z103**.


Microsoft Excel - WERCboilers_betaFULL_Sep11
page 22
Truck & Equipment fuels
Blend biodiesel fuels and describe truck & equipment fuel criteria
Fuel Prices, $/unit delivered:
unit
% Renewable
% Regional source
% Local distributor
% Regional distributor
% In-state distributor
On road diesel fuel $4.00 gallon 0.0% 0.0% 100.0% 100.0% 100.0%
biodiesel B100 $5.00 gallon 95.0% 50.0% 100.0% 100.0% 100.0%
B20 biodiesel blend $4.25 gallon 19.0% 10.0% 100.0% 100.0% 100.0%
B50 biodiesel blend $4.50 gallon 47.5% 25.0% 100.0% 100.0% 100.0%
Off road diesel fuel $3.50 gallon 0.0% 0.0% 100.0% 100.0% 100.0%
blend biodies
20%
50%
Describe truck & equipment fuel criteria
Fuel tax revenue per unit – town
Fuel tax revenue per unit – county
Fuel tax revenue per unit – state
Sales tax revenue % to local
Sales tax revenue % to county
Sales tax revenue % to state
On road diesel fuel gallon $0.00 $0.00 $0.00 0.0% 0.0% 0.0%
biodiesel B100 gallon $0.00 $0.00 $0.00 0.0% 0.0% 0.0%
B20 biodiesel blend gallon $0.00 $0.00 $0.00 0.0% 0.0% 0.0%
RESULTS input defaults
Ready
Sum=70%

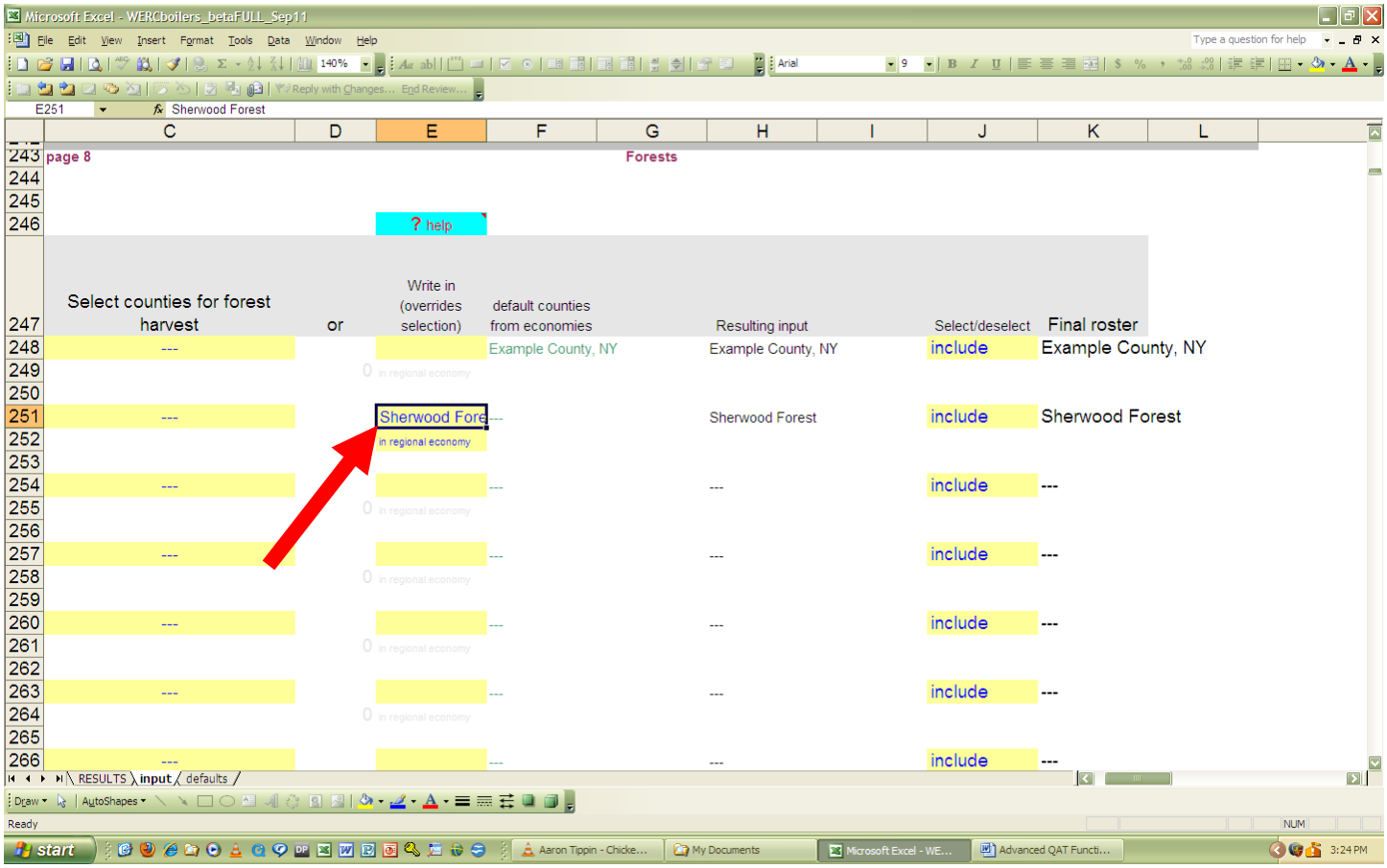
The model will automatically calculate default specifications for each new fuel and the new fuels will be available for selection in corresponding dropdown boxes throughout the model.



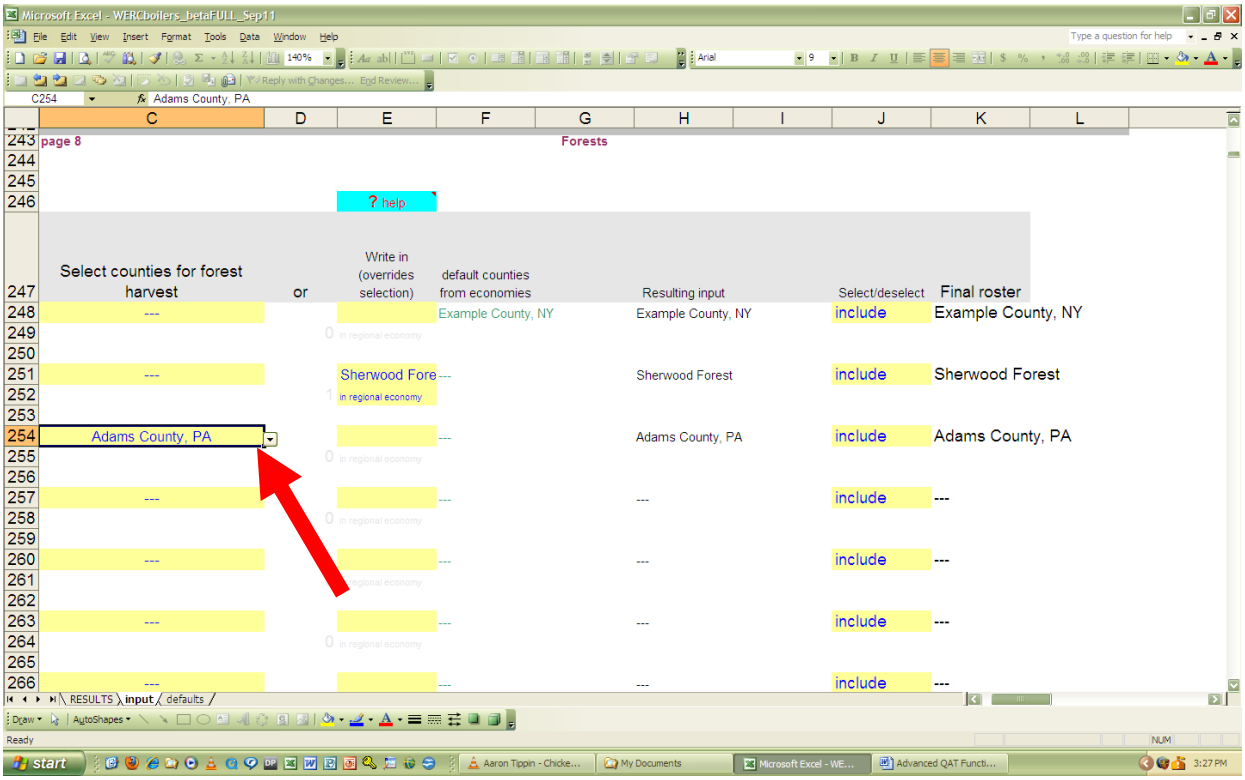
Creating Custom Tracts of Regional Forest

When you select counties from drop down boxes the QAT automatically assembles your "regional forest" complete with pertinent data from FIA. On occasion you may desire to include a specific tract of forest, not synonymous with any county. The QAT makes it possible to do that by using the "write-in" feature. Here's how to do it using an example of a 1000 acre tract we will call "Sherwood Forest":

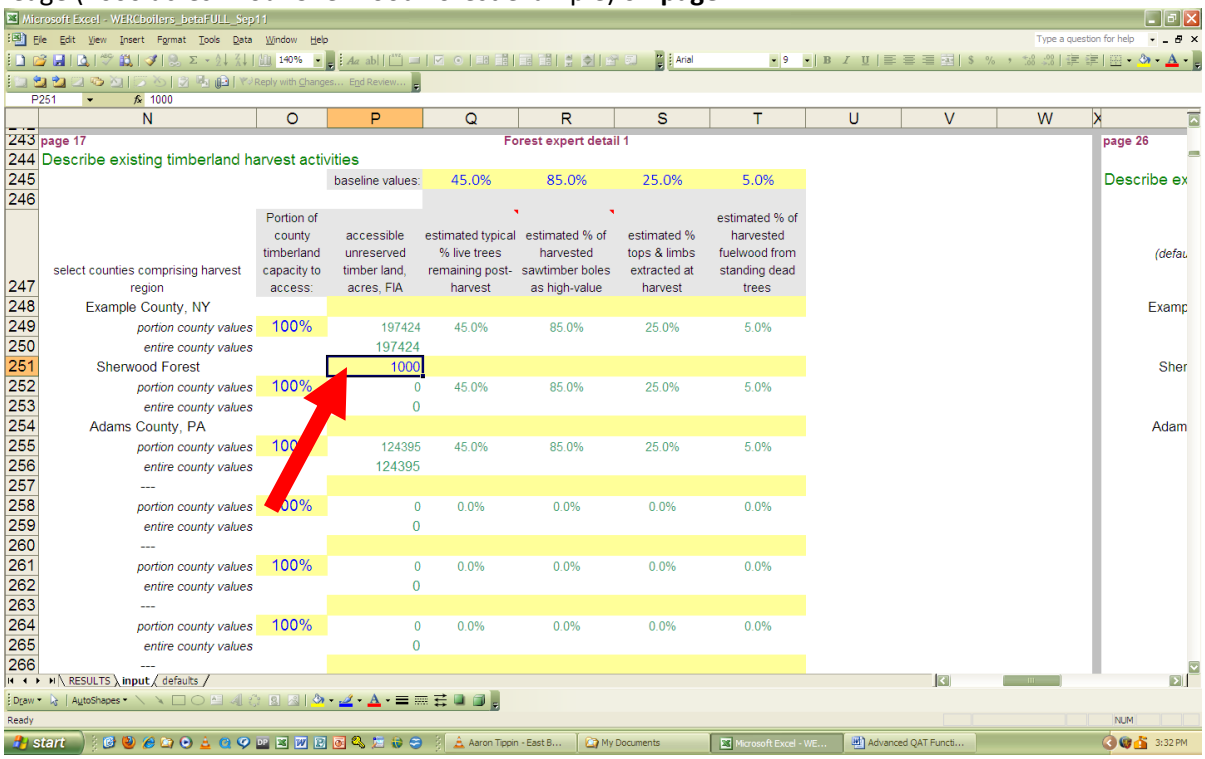
1. Make your first entry on the **page 8** of the INPUT Tab, as shown:



2. Enter all forest specifications on **page 26**. It may be helpful to use data from a similar county to guide your data input -- just select an appropriate county (we will use Adams County, PA in this example) from which to copy values, as shown:



Enter the acreage (1000 acres in our Sherwood Forest example) on **page 17**:

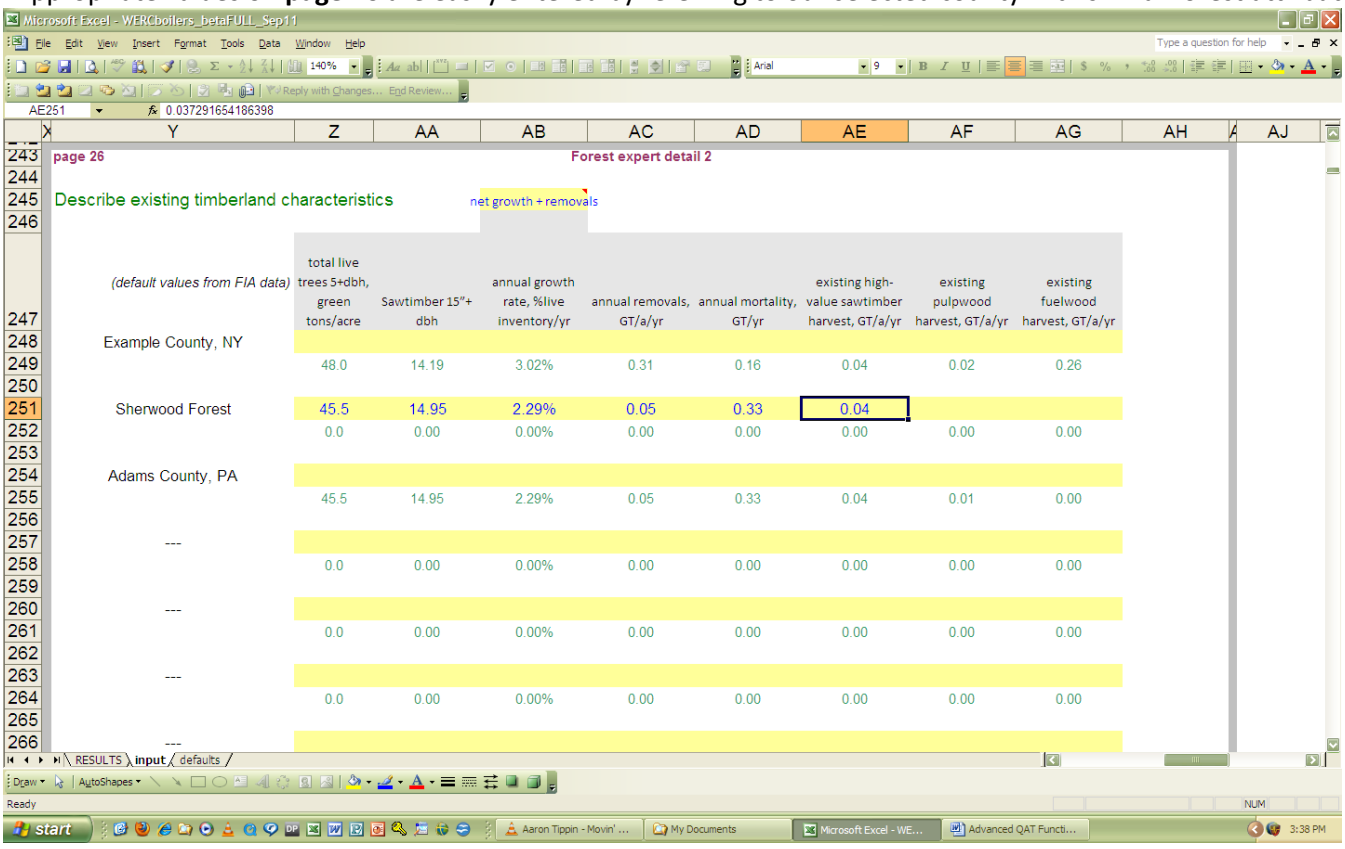


page 17 — Forest expert detail 1

Describe existing timberland harvest activities

select counties comprising harvest region	Portion of county timberland capacity to access:	accessible unreserved timber land, acres, FIA	estimated typical % live trees remaining post-harvest	estimated % of harvested sawtimber boles as high-value	estimated % tops & limbs extracted at harvest	estimated % of harvested fuelwood from standing dead trees
baseline values:			45.0%	85.0%	25.0%	5.0%
Example County, NY						
portion county values	100%	197424	45.0%	85.0%	25.0%	5.0%
entire county values		197424				
Sherwood Forest		1000				
portion county values	100%	0	45.0%	85.0%	25.0%	5.0%
entire county values		0				
Adams County, PA						
portion county values	100	124395	45.0%	85.0%	25.0%	5.0%
entire county values		124395				
---						
portion county values	00%	0	0.0%	0.0%	0.0%	0.0%
entire county values		0				
---						
portion county values	100%	0	0.0%	0.0%	0.0%	0.0%
entire county values		0				
---						
portion county values	100%	0	0.0%	0.0%	0.0%	0.0%
entire county values		0				

Appropriate values on **page 26** are easily entered by referring to our selected county with similar forest attributes.



page 26 — Forest expert detail 2

Describe existing timberland characteristics

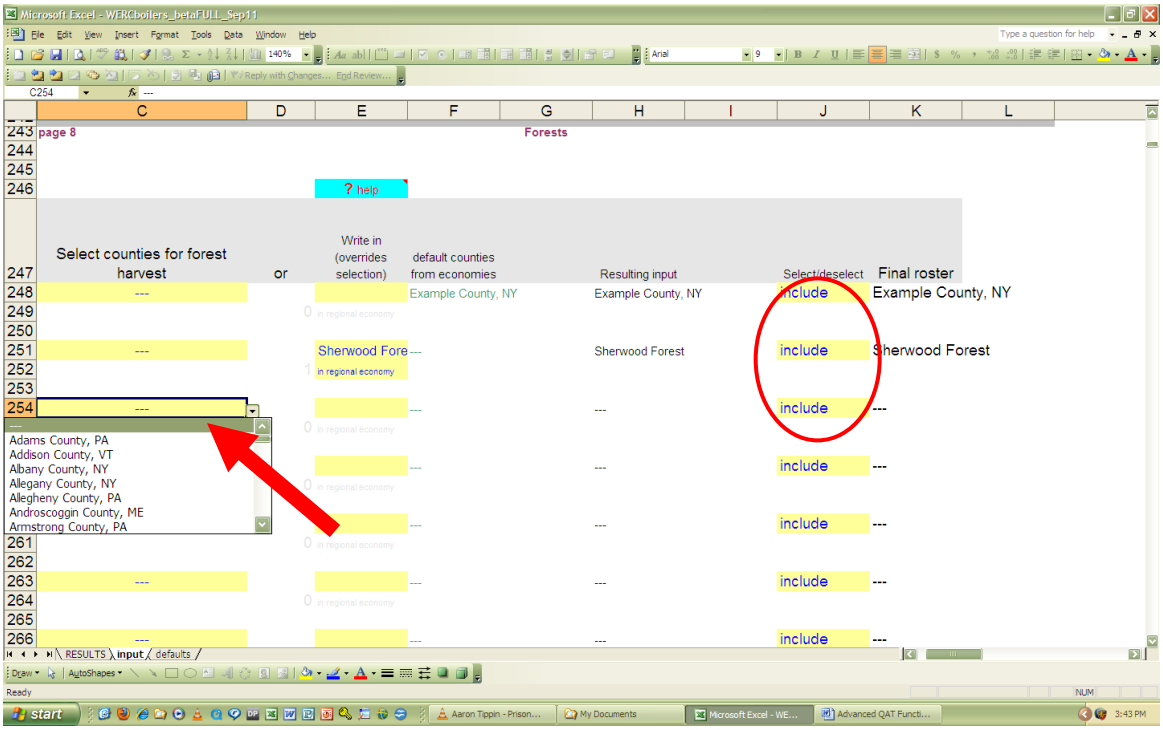
(default values from FIA data)	total live trees 5+dbh, green tons/acre	Sawtimber 15"+ dbh	net growth + removals: annual growth rate, %live inventory/yr	annual removals, GT/a/yr	annual mortality, GT/yr	existing high-value sawtimber harvest, GT/a/yr	existing pulpwood harvest, GT/a/yr	existing fuelwood harvest, GT/a/yr
Example County, NY								
	48.0	14.19	3.02%	0.31	0.16	0.04	0.02	0.26
Sherwood Forest	45.5	14.95	2.29%	0.05	0.33	0.04		
	0.0	0.00	0.00%	0.00	0.00	0.00	0.00	0.00
Adams County, PA								
	45.5	14.95	2.29%	0.05	0.33	0.04	0.01	0.00

	0.0	0.00	0.00%	0.00	0.00	0.00	0.00	0.00

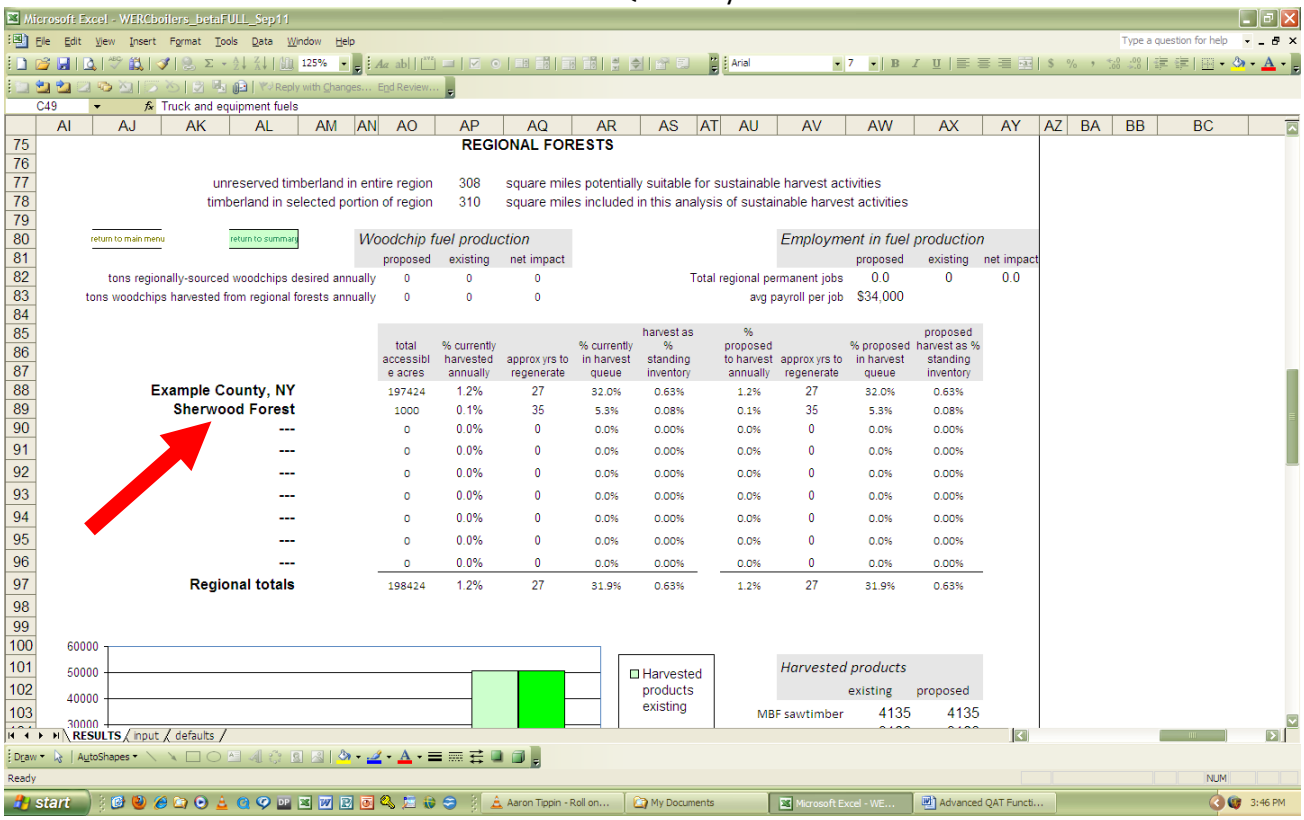
	0.0	0.00	0.00%	0.00	0.00	0.00	0.00	0.00

	0.0	0.00	0.00%	0.00	0.00	0.00	0.00	0.00

After completely entering data describing "Sherwood Forest" our Adams County, PA guidelines may no longer be needed. Remove by simply returning to **page 8**, highlight the Adams County dropdown box and select the "---" null indicator:

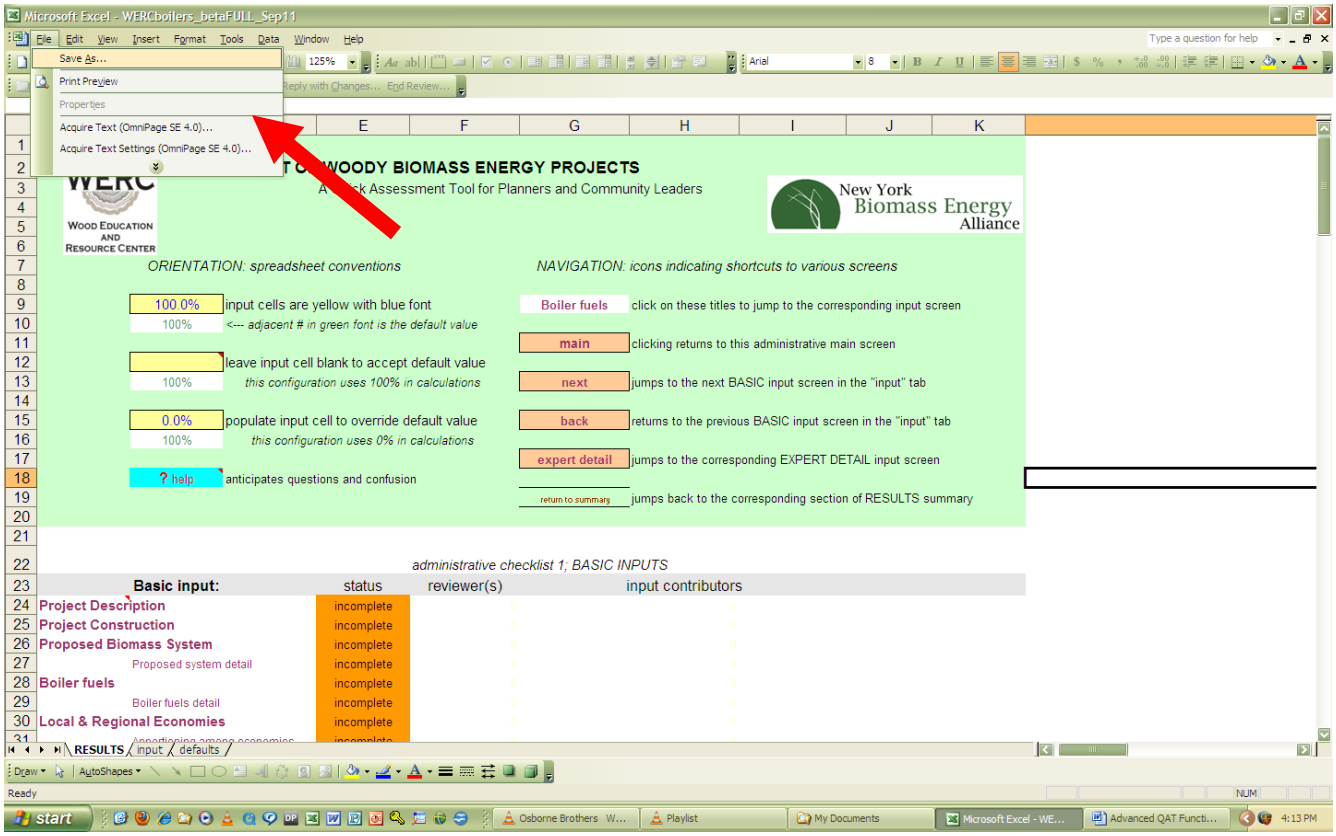


3. Our "Sherwood Forest" tract is now included in the QAT analysis:


REGIONAL FORESTS
unreserved timberland in entire region 308 square miles potentially suitable for sustainable harvest activities
timberland in selected portion of region 310 square miles included in this analysis of sustainable harvest activities
Woodchip fuel production
Employment in fuel production
Example County, NY
Sherwood Forest
Regional totals
Harvested products existing
Harvested products
existing proposed
MBF sawtimber 4135 4135

Comparing Various Scenarios

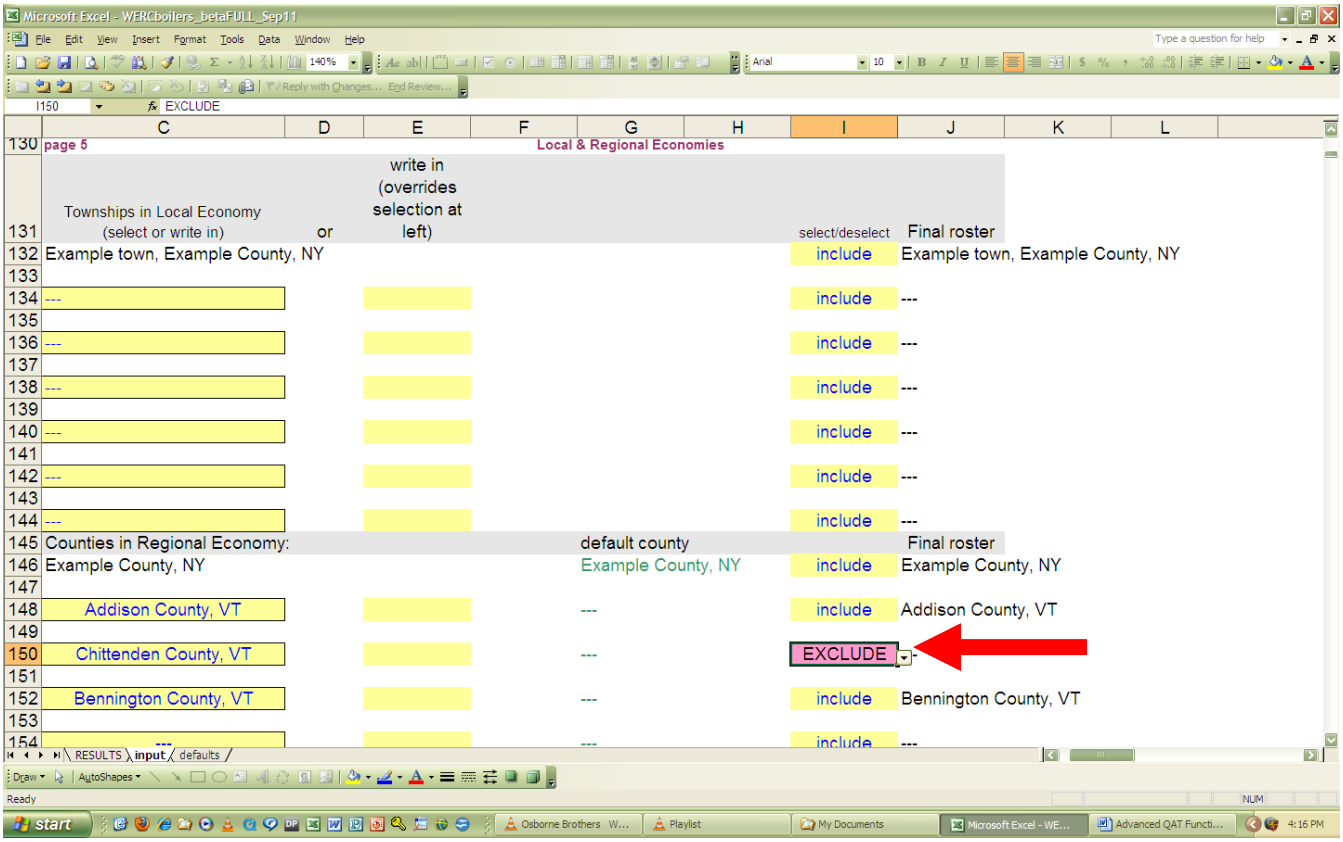
Often we are interested in comparing two analyses using slightly different inputs in each. Perhaps you simply wish to compare one boiler fuel to another, perhaps you wish to explore how various counties might be assembled to best define a "regional forest", or you may need to simulate several alternative configurations of your proposed project. In any case, comparisons are best accomplished by creating and saving each scenario in a separate Excel file with a unique descriptive filename, and the QAT makes this chore quite easy. By developing one detailed QAT assessment of your project and saving it as a base case, various modifications can be made and each preserved by using the "save as" feature in Excel and giving the modified version a unique file name.


Microsoft Excel - WERCboilers_betaFULL_Sep11
Save As...
Print Preview
Properties
Acquire Text (OmniPage SE 4.0)...
Acquire Text Settings (OmniPage SE 4.0)...
WOODY BIOMASS ENERGY PROJECTS
Wood Education and Resource Center
New York Biomass Energy Alliance
ORIENTATION: spreadsheet conventions
NAVIGATION: icons indicating shortcuts to various screens
100.0% input cells are yellow with blue font
100% <--- adjacent # in green font is the default value
leave input cell blank to accept default value
100% this configuration uses 100% in calculations
0.0% populate input cell to override default value
100% this configuration uses 0% in calculations
? help anticipates questions and confusion
Boiler fuels click on these titles to jump to the corresponding input screen
main clicking returns to this administrative main screen
next jumps to the next BASIC input screen in the "input" tab
back returns to the previous BASIC input screen in the "input" tab
expert detail jumps to the corresponding EXPERT DETAIL input screen
return to summary jumps back to the corresponding section of RESULTS summary
administrative checklist 1, BASIC INPUTS
Basic input: status reviewer(s) input contributors
Project Description incomplete
Project Construction incomplete
Proposed Biomass System incomplete
Proposed system detail incomplete
Boiler fuels incomplete
Boiler fuels detail incomplete
Local & Regional Economies incomplete
RESULTS input defaults
Ready
start
4:13 PM

Exploring various configurations of "local" and "regional" economies, "regional" forests

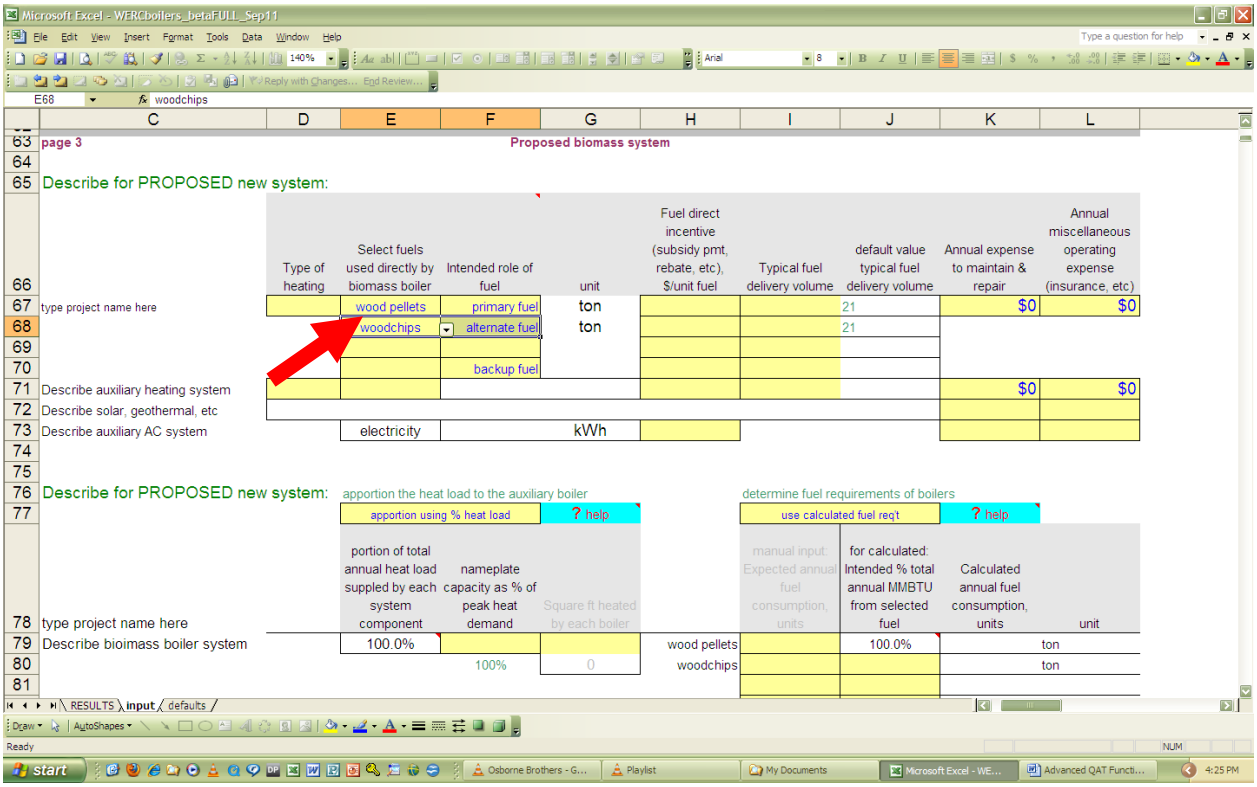
The QAT offers several features to simplify trial-and-error analysis and to accommodate simple comparisons among towns and counties selected to make up regional forests and local & regional economies.

It is possible to select up to 6 townships and 8 counties to include in local and regional economies, respectively. Likewise it is possible to select up to 9 counties for inclusion in a regional forest. In each case, individual selections can be included or excluded from the analysis – the "final roster" shows only selections included in the current analysis:

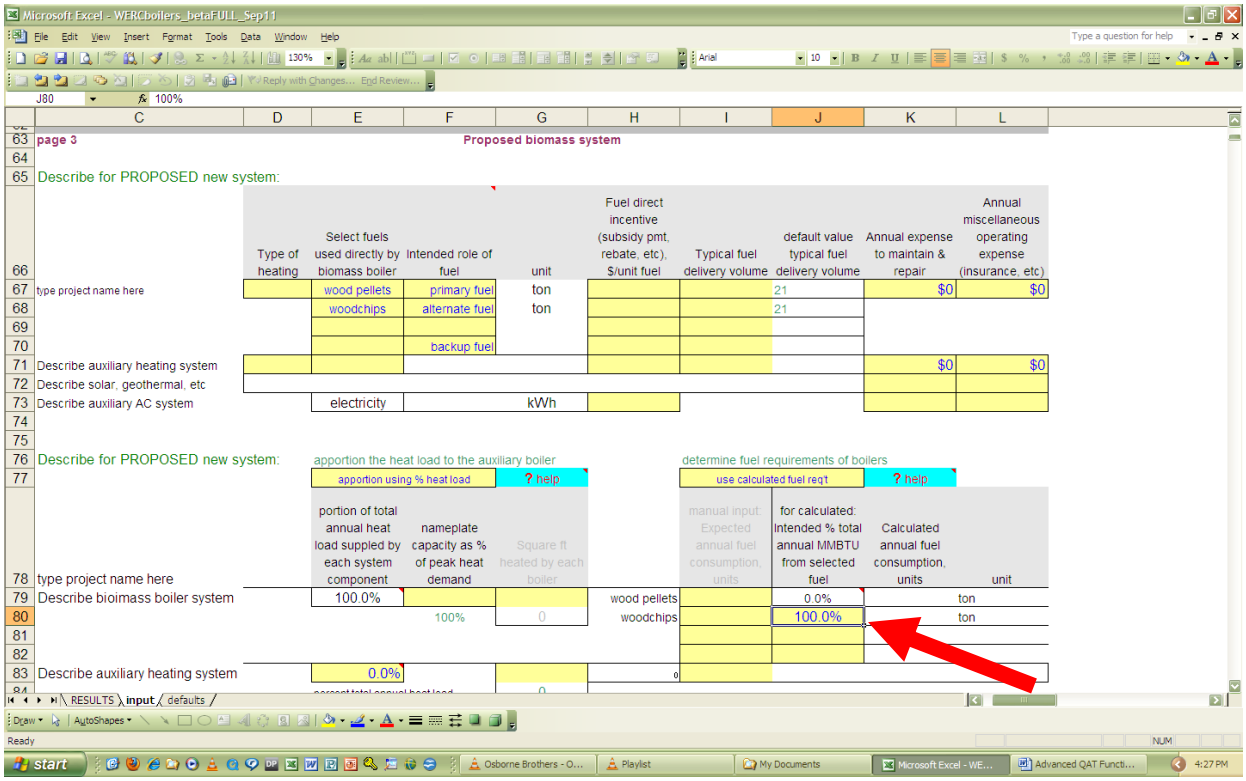


Exploring various boiler fuels

Several boiler fuels can be handily compared by including them as “primary” and “alternate” fuels on the INPUT tab, page 3, as shown:



Later on **page 3** you can include or exclude a boiler fuel by apportioning as 100% or 0%, as shown:



In the illustration above by apportioning woodchips at 100% only woodchips will be used in the analysis, excluding wood pellets. To run an assessment using only wood pellets simple apportion woodchips to 0%, setting wood pellets to 100% thereby excluding them from the analysis.

Comparing different QAT assessments

To compare two or more assessments side by side, open both files and simply use Excel's built-in features for displaying multiple windows, displaying split screens, etc, as you desire. These standard Excel techniques are described in any good Excel handbook. The QAT preserves the fullest possible native Excel functionality as a convenience for the advanced user who has a solid working familiarity with the conventions, constraints and conflicts inherent to the operation of Microsoft Excel workbooks.

To easily contrast and compare many QAT assessments the “Biomass Project Compiler” tool conveniently gathers and arranges multiple project reports in a list, easily edited and readily populated with user-defined project attributes. The “Biomass Project Compiler” can be downloaded from here -- http://biomassenergyqat.wordpress.com/biomass-project-compiler/.

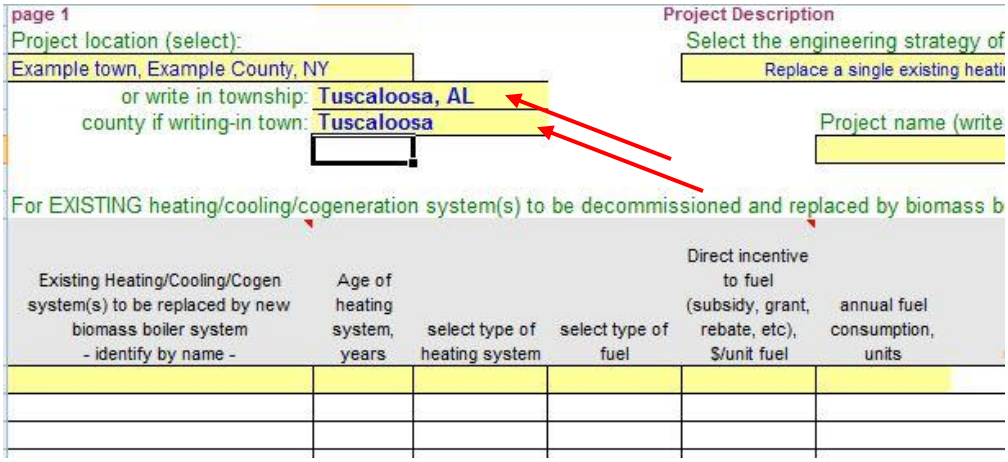
How to use the Quick Assessment Tool if your project is located outside of the nine pre-loaded Northeastern states

The Quick Assessment Tool is loaded with geographically associated data for 9 Northeastern States: Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont. This includes data from the FIA, the U.S. Census Bureau, and the EPA. In the future, if funding is available, the project team will expand the Quick Assessment Tool to other regions of the country. For example, there could be a Southeastern version of the Quick Assessment Tool, with data loaded for Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee. Future updates will be well publicized. In the mean time, if your project is located outside of the nine Northeastern states mentioned above, this section will describe how to load necessary data to run your assessment.

The ability to write-in geographies expands the functionality of the model for all users, in that it may be occasionally useful for a user, when considering regional economies and harvesting areas that may cross state boundaries beyond the 9 preloaded states. ***Note: Write-ins amplify the power of the model, but average users in the Northeast do not need to use the write-in function.*** The write-in feature and these instructions are to accommodate users in the 41 states not pre-loaded and the small portion of users in the 9 states whose economic and harvesting regions are partially outside of the preloaded area. The input pages' layout necessarily places the write-in input cells adjacent to the dropdown boxes; however, you do not need to use write-ins at all if you are working within the 9 Northeastern states -- just select townships and counties from the drop down boxes.

Here are the instructions on how to provide "write-in" economic, air quality and forestry information:

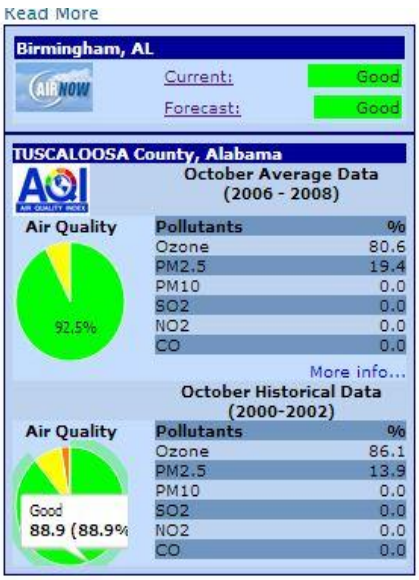
1. On **page 1** on the INPUT Tab, type in the name of the township, with the state abbreviation in cell **D4E4**, and the name of the county in cell **D5E5**, as indicated by the arrows, below.


page 1
Project Description
Project location (select):
Select the engineering strategy of
Example town, Example County, NY
Replace a single existing heati
or write in township: Tuscaloosa, AL
county if writing-in town: Tuscaloosa
Project name (write
For EXISTING heating/cooling/cogeneration system(s) to be decommissioned and replaced by biomass b
Existing Heating/Cooling/Cogen system(s) to be replaced by new biomass boiler system - identify by name -
Age of heating system, years
select type of heating system
select type of fuel
Direct incentive to fuel (subsidy, grant, rebate, etc), $/unit fuel
annual fuel consumption, units

(On **page 10**, average annual payroll information for existing workers you will need to input from real figures for existing systems; there will be default IMPLAN values for new biomass systems.)

2. For **page 20**, ambient air quality data for your location can be found at http://www.epa.gov. On the lower left of the opening page you will see the MyEnvironment tool, as seen on the next page. Follow the instructions for your project location. Click "go." The results will include a "My Air" section (shown below). If you click on "More air" a more detailed page will open, with an Air Quality Index (AQI) number specifically for PM2.5.

(As you can see in the summary for Tuscaloosa, AL, the pollutants of concern for ambient air quality are Ozone and PM2.5. However, for the purposes of the Assessment Tool, onlyPM2.5 levels are needed; Ozone levels do not factor into the calculations.)



Once you have the PM2.5 AQI, go to http://www.airnow.gov/index.cfm?action=resources.aqi_conc_calc, a converter from AQI to pollutant concentration. Enter the AQI into the input cell and the concentration (ug/m3) will be generated. This number can then be entered into **AE43** on **page 20**.

3. Local and Regional Economies – On **page 5**, you are asked to define your local and regional economies. Since your location is outside of the preloaded states, you will need to type-in the township and county information, as shown below. ***Note: EXCLUDE the Example town and Example County***.

4. Local and regional economic data on **pages 14 & 23** will need to be manually input. The data can be found at the U.S. Census Bureau's American FactFinder site, http://www.factfinder2.census.gov/. Follow the FactFinder instructions. Identify the townships and counties within the FactFinder geographies function and then select economic characteristics. This will generate data that can be viewed on the web page or downloaded as an Excel file. The data needed for each of the townships for **pages 14** is shown below. The data needed for the counties on **page 23** is the same as the township data (in red brackets), except that it is for each county that makes up your project's regional economy, rather than each township. These headings are taken directly from the Census data. The data should be entered in the yellow cells.

page 14 — Local economy expert detail

Township		Total households	Mean household income (dollars)	Median household income (dollars)	All families whose income below poverty level (percent)	Civilian labor force: employed	Civilian labor force: unemployed	Population 16 years and over
Example town, Example County, NY	*default value:*	3985	83127	62581	4.8	4787	303	7782
Tuscaloosa	*default value:*							

Note: on page 8, be sure to EXCLUDE the example county from the counties for forest harvest.

5. On **page 15**, if you know your state, county and local sales tax, enter these figures in **O173**, **P173** and **Q173**, respectively.

6. For **pages 17 & 26**, go to www.fia.fs.fed.us/ to access the FIA data by county. In row, **P251:272**, on **page 17,** you will need the "accessible, unreserved timberland" in acres for each county included in your forest harvest -- this value can be found in each county's FIA data. On **page 26**, you will need the data from the FIA, below. The headings are taken directly from the FIA.

total live trees 5+dbh, green tons/acre	Sawtimber 15"+ dbh	annual growth rate, %live inventory/yr	annual removals, GT/a/yr	annual mortality, GT/a/yr	existing high-value sawtimber harvest, GT/a/yr	existing pulpwood harvest, GT/a/yr	existing fuelwood harvest, GT/a/yr

Now you are all set.

PRINTING

Each input and results worksheet is laid out in pages that can be printed in Excel with no additional formatting. Please examine the worksheet in "print review" mode to determine which pages should be printed. Printing boundaries do not need to be adjusted; the pages are already formatted to print.

Interpreting the Results

After completing the input pages in the assessment tool you can see your results in under the RESULTS Tab. This section will guide you through the results provided after completing the inputs. The results from using the tool include detailed economic information, regional forest information, emissions/sustainability information, and demographic information.

Note: All yellow cells with blue text on the RESULTS pages are drop down menus. These drop down options allow you to look at different results within each of the RESULTS pages. For example, in the Air Quality Results page, the type of pollutant can be selected that you would like to model – the choices are PM 2.5, CO, NO_x, SO_2.

Economic Information

The results tab in the assessment tool will guide the user through the total temporary and permanent jobs created and the average payroll for those positions, project costs, payback information, and supporting infrastructure costs. This information will be displayed in both graphs and tables.

Regional Forest Information

Regional Forest information provided include the potentially suitable acres for sustainable harvesting activities and square miles included in sustainable harvest analysis, total woodchips required annually, wood chips from a regional source, total accessible acres, percent harvested annually, years for regeneration, percent currently in harvest, current harvest as standing, proposed harvest (percent), existing tons of [saw timber, fuel wood, and pulp], and both existing and proposed sustainable timberland utilization information.

Emissions/Sustainability Information

The assessment tool will guide the user through several components of sustainability including air quality estimate in comparison to national ambient air quality standards for the proposed and existing projects, pollutant concentrations, GHG emissions, GHG life cycle, residual ash production, fuel independence, permit requirements ***– it is important to note that you should always check with the environmental agency of your state to determine what the permitting process is for your location. ,***

Demographic Information

Demographic information provided includes township and county 2010 census information in reference to household incomes and unemployment rates, and sales tax revenue to the county for existing and proposed projects/infrastructure changes.

GLOSSARY OF ACRONYMS & TERMS

$	"dollars", as used in the QAT refers to nominal U.S. dollars
$/MMBTU	"dollars per million British thermal units", a measurement for cost of energy in U.S. dollars
$/ton	“dollars per ton”
% live inventory/yr	"percent live inventory per year", refers to a subset of living trees, expressed as a percentage
1000lb	“thousand pounds”, a standard measure for volume of steam generated and delivered
5+dbh	refers to standing trees five inches and greater diameter at “breast height” of 4.5 feet above ground level ("10+dbh" refers to standing trees ten inches and greater diameter at breast height, and so forth)
AC	"air conditioning", as used in the QAT refers to mechanical cooling of a building or structure
AC unit	"air conditioning unit", mechanical device to cool a building or structure
accessible unreserved timberland	a USFS-FIA designation for wooded land that contains merchantable timber, is not part of any forest preserve and is potentially available for commercial management, including harvest
additional harvest existing acres	a QAT expression referring to increased fuelwood harvest as modification of existing high-grade logging practices; for example at woodchip price of $25 per ton loggers may high-grade a woodlot, leaving potential fuelwood standing, whereas at a price of $35 per ton for woodchips or for some other remuneration loggers may follow sustainable harvest prescriptions calling for removal of cull trees to improve a woodlot for the future.
alternate fuel	a QAT expression referring to a boiler fuel that may be substituted for the primary fuel or that may be co-fired with the primary fuel
annual direct sustained net economic impact	a QAT expression referring to predictions of routine economic activity associated with normal operation of a boiler system post-construction
annual growth rate	a QAT expression referring to the average pace of regrowth of forest after harvesting; for example a combination of FIA “net growth” plus “annual removals”

annual mortality	a USFS-FIA designation for trees expected to die from natural causes in a tract of forest during any 12 month period
annual removals	a USFS-FIA designation for trees expected to be felled and carried away from a tract of forest during any 12 month period
APR	"annual percentage rate", refers to interest accrued during 12 months expressed as a percent of the principal balance
ash residue	a QAT expression referring to charred material remaining in the firebox of a boiler post-combustion that must be removed, handled and ultimately disposed of
auxiliary AC system	a QAT expression referring to stand alone air conditioning unit supplementing the biomass boiler in a proposed installation
auxiliary boiler, auxiliary heating system	a QAT expression referring to stand alone boiler unit supplementing the biomass boiler in a proposed installation; for example, when adding a new biomass boiler to supplement an existing heating system for purposes of the QAT model the new biomass boiler becomes the primary biomass boiler is considered to be of primary interest and the existing boiler becomes the "auxiliary boiler"
b.h.p.	"boiler horsepower", a standard rating measurement for capacity of boilers
backup fuel	a QAT expression referring to a standby fuel source utilized by a biomass boiler in situations where primary and alternate biomass fuels are unavailable or inadequate; for example, a biomass boiler may be configured to burn woodchips and have built-in a means of burning heating oil or propane to assure the biomass boiler always can meet demand
British thermal unit	a standard measure for quantity of energy
BTU	"British thermal unit", a standard measurement for quantity of energy
Btu/hr	"British thermal units per hour", a standard rating measurement for capacity of boilers
building thermal efficiency	a QAT expression referring to estimates of energy required to heat a structure, as MMBTU per square foot per year
capital investment	refers to money expended to purchase assets like land, buildings, equipment, or alternatively refers to current market value of those assets

CO	"carbon monoxide", a gaseous chemical byproduct of incomplete combustion of fuel
CO 8hrs	standard measurement of exposure to carbon monoxide during an eight hour interval
CO2	"carbon dioxide", a gaseous chemical byproduct of fuel combustion
CO2 equivalent GHG, CO2eq	"carbon dioxide equivalent greenhouse gas", a relative measure of all emission gases with varying capacities to possibly cause heat to be trapped in the earth's atmosphere, summed together an expressed in terms of how much carbon dioxide would be required to have the same effect
coefficient of performance	a standardized rating for chilled water technology, refers to the mechanical efficiency of water chilling equipment
cogeneration	the sequential or simultaneous generation of multiple forms of useful energy (usually mechanical and thermal) in a single, integrated system; for example, a biomass boiler may serve to heat a building and provide domestic hot water, etc. or in the case of a combined heat-power (CHP) plant a biomass boiler might heat buildings with “waste” heat being captured and used to generate electricity
collection efficiency	a QAT expression referring to the effectiveness of emissions abatement technology expressed as % of pollutant removed
combustion efficiency	a measure of useful heat extracted from a fuel source by an operating heating appliance
committed timberland	a QAT expression referring to forested acres held in reserve for future harvest, necessary for a sustainable harvest rotation
COP	"coefficient of performance"
cubic yds	"cubic yards", a standard measurement for volume
cuft	“cubic feet”, a standard measure for volume
cuft/yr	"cubic feet per year"
days/yr	"days per year"

dbh	"diameter at breast height", a standard measurement for dimension of standing trees referring to diameter of a tree measured at 4.5 feet above ground level
decommission	a QAT expression referring to the process of taking an existing heating system out of service, including physically removing it and completing any necessary remediations to the site (eg: cleanup of asbestos, lead, etc.)
direct impact	an IMPLAN term referring to first order jobs/spending, etc attributed to an enterprise; for example payroll, supplies purchased, equipment purchased, operating expenses, etc.
disposable income/wage	a QAT expression referring to the after-tax portion of payroll available to be expended in an economy; for example, for rent, food, clothing, vehicles, etc.
distribution & delivery efficiency	a QAT expression referring to energy loss along distribution channels in a system; for example heat loss as steam is transmitted from a boiler to several buildings via underground piping
effective electric efficiency	calculations allowing for a direct comparison of combined heat-power (CHP) to conventional power generation system performance
effective stack height	Distance a chimney rises above nearest obstruction or roof line
efficiency of electricity generation	Refers to portion of energy wasted during conversion to electricity
EPA	"Environmental Protection Agency"
establishment cost	a QAT expression referring to expense incurred in successfully planting a short rotation woody crop
existing heating system	a QAT expression referring to any currently operating heating system that will be replaced or supplemented with a proposed new biomass boiler
felling, transfer & handling	refers to the process of cutting down trees, delivering (ie. "skidding") them to a central collection site and manipulating them for processing
FIA	"Forest Inventory and Analysis Database", refers to detailed database complied and managed by US Forest Service
FLEH	abbreviation of "full load equivalent hours", a standard capacity rating designation for air

	conditioning systems
ft3	“cubic feet”, a standard measure for volume
ft/s	"feet per second"
FTE	"full time equivalent", a standard measure of jobs where one full time worker during 12 months represents a “full time equivalent” or“FTE”
fuel delivery volume	a QAT expression referring to size of average fuel deliveries; for example an oil fired system might be resupplied by frequent deliveries of, say, 800 gallons per visit
fuelwood	refers to trees harvested and processed for eventual combustion to release thermal energy, includes cordwood, woodchips and woodchips processed into pellets
g/m3	"grams per cubic meter"
gal/hr	"gallons per hour"
gal/ton	"gallons per ton"
GHG	"greenhouse gas", refers to airborne molecules believed to trap solar radiation in the earth's atmosphere, most notably carbon dioxide and methane
green tons	a QAT expression referring to measurement, in tons, of wood products at their naturally occurring moisture level (usually about 45-50% water)
greenhouse gas	refers to airborne molecules believed to trap solar radiation in the earth's atmosphere, most notably carbon dioxide and methane
gross cost	a QAT expression referring to the total expense incurred in acquiring a product or service before any grants, subsidies or discounts are applied
growth rate	a QAT expression referring to the average pace of regrowth of forest after harvesting; for example a combination of FIA “net growth” plus “annual removals”
GT	"green tons", refers to measurement, in tons, of wood products at their naturally occuring moisture level (usually about 45-50% water)

GT/a/yr	"green tons per acre per year"
GT/acre	"green tons per acre"
GT/yr	"green tons per year"
GVW	"gross vehicle weight", a standard rating measurement of combined weight of a motor vehicle and any payload; for example, semi trucks when fully loaded typically have a gross vehicle weight, or “GVW” of about 40,000 pounds
harvest queue	a QAT expression referring to forest land held in reserve to meet demand for future sustainable harvest; for example, for each acre harvested of forest with a regrowth time of 40 years, another 40 acres must be available in the “harvest queue” if one acre is to be sustainably harvested each year without interruption.
heat load	a QAT expression referring to energy requirement that must be met by a boiler system; demand for energy placed by space heating requirements, appliances such as domestic hot water coils, water chillers, steam offtakes, etc.
high-value	a QAT expression referring to that portion of trees yielding merchantable saw timber; distinct from that portion of trees yielding only pulpwood or fuelwood, or cull trees to be felled and left on the forest floor for ground cover
highway infrastructure	refers to presence and load rating of roadbeds, bridges, underpasses, intersections, traffic control devices, safety devices, etc.
hp	"horsepower"
IMPLAN	popular commercial software used by economic planners to predict number of jobs and economic impacts to an economy resulting from some direct activity
indirect impact	an IMPLAN designation referring to jobs and economic activity necessary to support entities engaged in direct impact; for example, if our direct impact activity is woodchip production then the logging crew is supported, for example, by the seller of chipping machines whose impact, in turn, on the economy is termed “indirect”
induced impact	an IMPLAN designation referring to jobs and economic activity resulting from a rippling of direct impact through an economy; for example if our direct impact activity is woodchip production then out of wages paid to a member of the logging crew, that portion which is spent for a pleasure boat induces supporting activity in the regional economy among boat dealers, marinas, insurance

	salesmen, etc., all considered to be “induced impact”
industry std MPG	"industry standard miles per gallon", as a QAT expression “MPG” refers to a default value for quantity of fuel consumed each mile a fuel delivery truck is operated
km/h	"kilometers per hour"
knot	as used in the QAT a standard measure for wind velocity
kW	"kilowatts", a standard measure of electrical energy
KW/ton	kilowatt per ton, a standard measure for capacity of air conditioning unit
kWh	"kilowatt-hours", a standard measurement quantifying electrical energy
lb	“pound” (U.S.), a standard measure for weight
lb/gal	"pounds per gallon", a standard measurement quantifying the density of some liquid
life cycle greenhouse gas emissions	As a QAT expression, refers to greenhouse gases generated not only when fuel is consumed, but also greenhouse gases generated when that fuel was initially produced; a popular but inexact predictor of environmental impact
live inventory	a USFS-FIA designation for living trees present on a parcel of forested land
local economy	a QAT expression referring to selected townships comprising a designated concise economic region
LoS Heating fuel oil	"low sulfer heating fuel oil", refers to reduced sulfur heating oils commonly available in the U.S. retail market
m	“meter (metric)”, a standard measure for linear distance
m/s	"meters per second", a standard measure for velocity
machine hours	refers to cumulative time a piece of equipment has been operated or must be operated to accomplish a particular task

market value	refers to the prevailing price to buy or sell some item of value
MBF	"thousand board feet", a standard measure for volume of wood products
MBTU	"thousand British thermal units", a standard measurement of energy
mi	“miles (U.S.)”, a standard measure for linear distance
MJ/hr	"megajoules per hour", a standard rating measurment for capacity of boilers
Mlb	"thousand pounds", a standard measurement for volume of steam
MMBTU	"million British thermal units", a standard measurement of energy
MMBTU/hr	"million British thermal units per hour", a standard rating measurement for capacity of boilers
MMBTU/SF	"million British thermal units per square foot", a QAT expression referring to energy typically required to heat a building through the course of 12 months
monetized NPV	"monetized net present value", refers to the relative dollar value of some future benefit if its equivalent could be received today in cash.
monetized value incentive	refers to the net present dollar value of some benefit received; for example, a tax abatement over several years, volunteer labor, rebate to be received in the future, etc.
MPG	"miles per gallon"
mph	"miles per hour", a standard measurement of velocity
MW	"megawatts", a standard rating measurement for capacity of boilers
nameplate capacity	industry convention designating the maximum rated capacity of any piece of equipment, such as a boiler; this rating is typically printed on the nameplate affixed to the equipment
net cost	a QAT expression referring to the final expense incurred in acquiring a product or service after any grants, subsidies or discounts are applied

net growth	a USFS-FIA designating gross growth minus loss of volume due to mortality
new structure	a QAT expression referring to newly constructed floor space distinct from existing floor space or remodeled existing structure
NO2	nitrogen dioxide, a gas emitted during combustion of various fuels
NO2 annual average	standard measurement of exposure to nitrogen dioxide during a 12 month period
NOx	"oxides of nitrogen", refers to nitrogenous emissions
NPV	"net present value", value of a future revenue if it were received today
OP & OH cost	"operating and overhead cost", refers to the total expense of achieving some business objective including burdens of cost of ownership, depletion of finite resources, etc.
operating cost	also sometimes "variable cost", refers to expenses incurred in the course of normal business such as money paid for supplies, payroll, rents, utilities, etc.
overhead cost	also sometimes "fixed cost", refers to expenses incurred to own the business and provide assets such as machinery, borrowed money, real estate, etc. that may be necessary to carry out day to day operations
particulate emissions	airborne molecules and small particles produced during combustion of various fuels
peak burn rate	a QAT expression referring to the highest level of performance expected of a boiler; based on calculations or actual experience
peak output rating	maximum rated capacity of any piece of equipment, such as a boiler; similar to nameplate capacity
permanent jobs	a QAT expression referring to jobs created or sustained in normal operation of a boiler system; does not include jobs created during the construction phase of a project
person-years, person-yrs	a standard measurement for quantity of human labor expended during 12 months; essentially equivalent to “FTE” or full time equivalent
PM 2.5	"particulate emissions smaller than 2.5 microns diameter"

PM 2.5 annual average	standard measurement of exposure to particulate emissions smaller than 2.5 microns during a period of 12 months
post-harvest	a QAT expression referring to events occurring after a woodlot has been harvested
ppb	"parts per billion"
ppm	"parts per million"
primary fuel	a QAT expression referring to a boiler fuel intended to consumed in the largest quantity or consumed in preference to any other fuels
proposed heating system	a QAT expression referring to a biomass boiler and any auxiliary boiler and/or supplemental equipment that is being contemplated for a project
pulpwood	refers to trees harvested and processed preliminary to paper manufacturing
QAT	"quick assessment tool", refers to this spreadsheet simulation of any proposed biomass project
regional economy	a QAT expression referring to selected counties comprising a designated economic region somewhat larger than the “local economy” comprised of selected townships
saw timber	refers to trees destined for processing into dimension lumber or veneer products
sawtimber boles	refers to the stem of any tree destined to be commercially harvested and processed into lumber
SF	"square feet"
SF/ton-hour	"square feet per ton-hour", a QAT expression referring to energy typically required to cool a building through the course of 12 months
short rotation woody crop	refers to cultivated biomass such as shrub willow or poplar intended for biomass fuel production
simple payback	a QAT expression referring to time, in years, required for accumulated savings in annual fuel expense to offset the installation cost of a replacement boiler system

slash	refers to tree tops and limbs remaining on the forest floor after merchantable timber is harvested and removed
SO2	"sulfur dioxide"
SO2 annual average	standard measurement of exposure to sulfur dioxide during a period of 12 months
SOx	"oxides of sulfer", refers to sulfur-related emissions
sq mi	"square miles", a standard measurement of area
SRWC	"short rotation woody crop", refers to cultivated biomass such as willow or poplar
stack	a chimney or smokestack
standing inventory	refers to the volume of woody material present before any contemplated harvest is undertaken
structure thermal efficiency	a QAT expression referring to estimates of energy required to heat a building, as MMBTU per square foot per year
stumpage price	refers to the cost to purchase standing trees for harvest
surplus tops & limbs	refers to tree tops and limbs remaining on the forest floor after merchantable timber is harvested & removed AND after some tops & limbs have been removed for processing in the initial logging operation
ug/m3	“micrograms per cubic meter”
t/hr	"tons per hour"
temporary jobs	a QAT expression referring to jobs created only during the construction phase of a project that are no longer available after construction is complete
thermal efficiency	a QAT expression referring to estimates of energy required to heat a building or structure, as MMBTU per square foot per year
timberland	a USFS-FIA designation for forest land containing commercially viable volumes of merchantable

	saw timber
ton-hr	"ton - hour", a standard unit of measurement for volume of chilled water, also a standard unit of measurement for capacity of steam boilers
tons/a	"tons per acre"
tons/yr	"tons per year"
tops & limbs	refers to tree tops and limbs remaining on the forest floor after merchantable timber is harvested and removed
total annual heat load	a QAT expression referring to energy requirement that must be met by a boiler system over the course of 12 months; demand for energy placed by space heating requirements, appliances such as domestic hot water coils, water chillers, steam offtakes, etc
TPY	"tons per year"
transfer	refers to delivery of woody material from its original location in a forest to some central collection point adjacent to the forest for further processing and shipment
transfer time	refers to time expended or some rate of delivery of woody material from its original location in a forest to some central collection point adjacent to the forest for further processing and shipment
ug/m3	"micrograms per cubic meter"
uncommitted timberland	a QAT expression referring to forested acres in excess of those held in reserve for future harvest, necessary for a sustainable harvest rotation
USFS	“United States Forest Service”
USFS-FIA	“United States Forest Service's Forest Inventory and Analysis” database, a massive database containing detailed observations of American forests
whole tree	refers to the process of harvesting and delivering entire trees (including limbs, leaves but without the stumps or roots) to be chipped or otherwise processed
yd	“yard”, a standard measure of linear distance

yd3	"cubic yards", a standard measurement of volume
yr	“year”
years to regenerate	a QAT expression referring to number of years for a harvested forest to regrow to pre-harvest inventory or volume

REFERENCES & OTHER RESOURCES

The Default Values have been developed by the project team through reviewing various papers and reports for relevant values. These values were then reviewed and vetted by our advisory panel, and modified when necessary. The finalized values were used to construct the Default Tab of the Quick Assessment Tool. We encourage you to investigate more specific information for your project and location.

Modeling inputs are from the following sources:

Environmental Protection Agency. *AirData*. Web. 2012.

National Renewable Energy Laboratory. *Jobs and Economic Development Impact (JEDI) model*. Web. 2012.

United States Census Bureau. *American Community Survey*. Web. 2013.

United States Department of Agriculture Forest Service. *Forest Inventory and Analysis Program Data*. Web. 2012-13.

The following sources were also reviewed to inform the development of the Quick Assessment Tools:

Environmental Protection Agency National Ambient Air Quality Standards. "Particulate Matter (PM) Standards Fact Sheets and Publications." Web. 2012.

National Renewable Energy Laboratory. *Life Cycle Assessment Harmonization Project*. Web. 2013.

Pace University Energy and Climate Center, and Cornell University. New York State. New York State Energy Research and Development Authority, New York State Department of Agriculture and Markets.*Renewable Fuels Roadmap*. Albany: 2010. Web.

Yellow Wood Associates and Biomass Energy Research Center. North Country Resource Conservation and Development (RC&D) Area Council. *Community Roadmap to Renewable Woody Biomass Energy*. 2009. Web.

And, vehicle traffic counts from assorted Northeastern state departments of transportation data, and other sources as indicated within the Quick Assessment Tool.

Other good tools reviewed for the development of the Quick Assessment Tool and publicly available on-line, follow. These tools can be used to extend Quick Assessment Tool results are:

- Northeast *State* Foresters' Association (NEFA) Northern Forest Biomass Project Evaluator (BPE), available at http://www.nefainfo.org/BPE.html -- BPE is "a project-level decision support tool for the assessment of available wood supply in the Northeastern U.S." (NEFA website).
- EcoWillow - An Economic Analysis Tool for Willow Short-Rotation Coppice for Wood Chip Production, available at http://www.esf.edu/willow/download.htm.
- UK based, Carbon Trust's Biomass Decision Support Tool – to assess biomass heating system sizing and integration, available at http://www.carbontrust.com/resources/tools/biomass-decision-support-tool.